This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

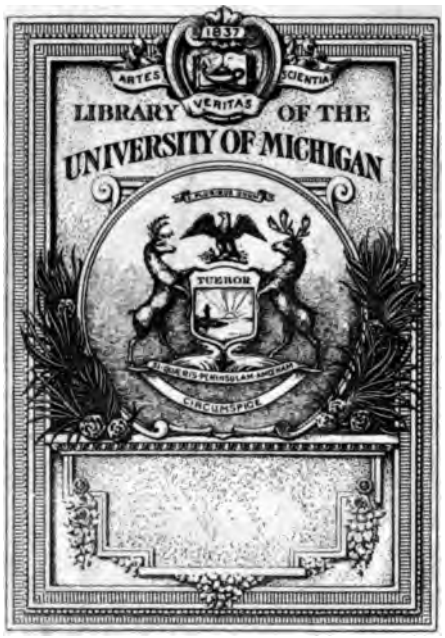
+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

A 490257

Sine-Moribus
Vanæ
Litera
THEOLOGIA
ASTRONOMIA
PHILOSOPHIA
MATHEMATICA
LOGICA
RHETORICA
GRAMMATICA


1837
ARTES
SCIENTIA
VERITAS
LIBRARY OF THE
UNIVERSITY OF MICHIGAN
TUEBOR
CIRCUMSPICE

THE GIFT OF

University of Pennsylvania

University Lectures

Delivered by

Members of the Faculty

in the

Free Public Lecture Course

1913–1914

PHILADELPHIA, PA.
PUBLISHED BY THE UNIVERSITY
1915

G.T.
R. E. Adams
12-19-28

TABLE OF CONTENTS

	PAGE
PREFACE	7
THE COURT OF QUEEN ELIZABETH. Professor Edward Potts Cheyney	9
THE PHYSIOLOGICAL ACTION OF ALCOHOL. Professor Alonzo E. Taylor	33
IS THE MONTESSORI METHOD A FAD? Professor Frank P. Graves.	55
A NATURALIST IN COSTA RICA. Professor Philip P. Calvert	63
THE ENGLISH BIBLE AS LITERATURE. Vice-Provost J. H. Penniman.	76
THE ARGUMENTS FOR AND AGAINST EXPERIMENTS ON ANIMALS. Professor Richard M. Pearce	95
CERVANTES. Professor Hugo A. Rennert	127
A TREE HUNT IN NORTH AFRICA. Professor J. Russell Smith	145
SOME NEW IDEAS IN GOVERNMENT. Professor James T. Young	153
THE SMOKE NUISANCE. Professor R. H. Fernald	165
HEBREW AND BABYLONIAN VIEWS OF CREATION. Professor Morris Jastrow, Jr	191
THE MONROE DOCTRINE AND AMERICAN FOREIGN POLICY. Professor L. S. Rowe	241
THE ECONOMIC AND BIOLOGIC ASPECTS OF THE HOOK-WORM DISEASE IN THE SOUTHERN UNITED STATES OF AMERICA. Professor Allen J. Smith	269
THE AMERICAN NOVEL—PAST AND PRESENT. Dean Arthur Hobson Quinn	302
THE VETERINARY PROFESSION AS A CAREER. Professor John W. Adams	327
THE GERMAN BARN IN AMERICA. Professor Marion D. Learned.	338
SCIENTIFIC MANAGEMENT IN EDUCATIONAL ADMINISTRATION. Professor Harlan Updegraff	350
THE PLAYS AND POETRY OF JOHN MASEFIELD. Professor Cornelius Weygandt	365

Contents

PAGE

THE RACE-MAKING PROCESS IN THE UNITED STATES. Professor J. P. Lichtenberger 398

BERLIN AND THE MODERN GERMANY. Professor William E. Lingelbach 408

THE IMPROVEMENT AND RECONSTRUCTION OF SUBURBAN AND COUNTRY ROADS TO WITHSTAND WEAR FROM MOTOR-DRIVEN VEHICLES. Professor William Easby, Jr 434

PLANT LIFE SEEN BETWEEN PHILADELPHIA AND ATLANTIC CITY. Professor John W. Harshberger 454

THE CONSERVATION OF THE PUBLIC HEALTH. Professor A. C. Abbott 464

THE CONTROL OF TRUSTS FROM A LEGAL POINT OF VIEW. Professor William Draper Lewis 487

SOME PROBLEMS OF HEREDITY. Professor C. E. McClung 503

THE NATURAL HISTORY OF THE GRAPE VINE. Professor John M. Macfarlane 514

THE EXCEPTIONAL CHILD—AT HOME AND IN SCHOOL. Professor Lightner Witmer 534

WHAT IS ELECTRICITY? Professor Arthur W. Goodspeed 556

THE MONASTERIES OF METEORA. Professor W. W. Hyde 576

PREFACE

This volume brings in permanent form a series of addresses by members of the teaching staff of the University of Pennsylvania. The general public constituted the audience and responded in numbers reaching far into the thousands. A distinct problem is presented in each lecture or address. It is treated in the light of the most recent research in the domain of which it is a part. So well received was this series of lectures, delivered every Saturday afternoon, that during the present academic year 1914–15, a similar course is being conducted and is meeting with most hearty approval.

May the messages contained in these pages prove helpful to all who may read them.

THE COURT OF QUEEN ELIZABETH

By Edward P. Cheyney

Professor of European History, University of Pennsylvania

The first of the free public lectures by members of the University Faculty, to be given every Saturday afternoon at 3 o'clock in Houston Hall, was delivered on Saturday, November 8th, by Professor Edward Potts Cheyney, A.M., LL.D., Professor of European History, who was presented by Provost Edgar F. Smith in a brief introductory address.

The auditorium of the hall was crowded and the lecture was received with an appreciation that was a high compliment to the speaker. Dr. Cheyney said:

In opening this series of lectures, in which professors in the University will speak each on some subject in which his study touches the broader interests of the community, I feel that I ought to apologize for choosing a subject so far removed from present-day life and thought as the details of the court of an English queen who reigned three hundred years ago. I can only plead the insatiable curiosity of mankind. Man wants to know everything that can be known and it is the duty of the scholar, the explorer, the investigator to make it known to him. He has long wanted to know what the surface of the earth is like from the North Pole to the South, and skilful and heroic explorers have recently made it known to him at a sad cost. He wants to know what life is at the bottom of the seas and how the most distant planets are constituted, and zoologists and astronomers are patiently investigating their problems and reporting their results. So it is with history. We want to know what man has really done on the earth, what man's life has been like in the past. Therefore, the historian must be always at work, utilizing all new material that becomes available and all new insight and equipment that may enable him to interpret this

material. And like other investigators, he must, from time to time, report what he has found. History is always making the appeal of Othello: "Speak of me as I am; nothing extenuate and naught set down in malice." Therefore, in trying to describe, as the result of a somewhat prolonged investigation in somewhat obscure records, the court of Queen Elizabeth, I am simply performing this service for a small and perhaps not very important field, but yet for an integral part of it. The whole of the past can be known only by studying its parts.

It is one of the ironies of history that contemporaries have so often given full narratives of matters in which our interest is comparatively slight and left us no record of things which we should so much like to know. But this subject is an exception to that rule. We have much contemporary information about the court and the personality of the great queen who came to the English throne 353 years ago today, and has given her name to the age in which she lived.

Some of the most valuable of this information comes from the reports of foreign visitors. One of these was a German, named Paul Hentzner, who came to England in 1598. He gives the following account of his visit:

"We came next to the royal palace commonly called Greenwich, which means Green Meadow. . . . The most serene queen of England, Elizabeth, was born here and prefers it as a dwelling place, especially in the summer time, on account of the loveliness of its situation. On entering this palace we were admitted, on an order obtained for us from the lord chamberlain, . . . to the presence chamber, adorned on all sides with precious tapestries (the floor, however, according to the English fashion, strewn with hay). Through this room the queen customarily passes when she wishes to enter her private chapel for prayers. At the door stood a nobleman dressed in velvet, with a gold chain, whose office was to introduce to the queen earls, barons, gentlemen and others of both sexes who came to wait on her; it was Sunday, when there is usually the greatest attendance of nobility. In the hall the archbishop of Canter-

bury, the bishop of London, a great number of councillors of state, officers of the crown and gentlemen were awaiting the queen's coming out. When it was time to go to prayers, the queen emerged from her private apartment attended in the following manner:

"First went noblemen, barons, earls and knights of the garter, all richly dressed and bareheaded; next, came the chancellor, bearing the seals in a red silk bag, between two attendants, one of whom carried the royal sceptre, the other the sword of state in a red scabbard studded with golden fleur-de-lys, the point upwards; next came the queen, in the sixty-fifth year of her age, as we were told, very majestic; her face oblong and fair but wrinkled; her eyes small, yet black and pleasant; her nose a little hooked; her lips thin and her teeth dark (a defect the English are subject to, doubtless from their too great use of sugar). She had in her ears earrings of very rich pendant pearls; her hair was dark yellow but false; upon her head she had a small crown; her bosom was bare, as all the English ladies have it till they marry, and she had on a necklace of exceeding fine jewels; her hands were small, her fingers long, and she was of middle stature. Her air was stately, her manner of speaking mild and obliging. That day she was dressed in white silk, bordered with pearls of the size of beans, and over this a mantle of black silk shot with silver threads; her train was very long, the end of it borne by a marchioness. Instead of a chain she had an oblong collar glistening with gold and jewels. As she went along in this state and magnificence she spoke very graciously, first to one, then to another, whether foreign ministers or those who attended for various reasons, alternately in her mother tongue, in French and Italian; for, besides being well skilled in Greek, Latin and the languages I have mentioned, she is mistress even of Spanish, Scotch and Dutch. Whoever speaks to her it is kneeling; though now and then she raises some one with her hand. While we were there a certain Bohemian baron, William Slawata, presented letters to her, and she, after pulling off her glove, gave him her right

hand sparkling with rings and jewels to kiss, a mark of particular favor. Wherever she turned her face as she was going along everybody fell down on their knees.

"The ladies of the court followed next to her, countesses, baronesses and gentlewomen, very handsome and well-shaped and for the most part dressed in white. She was guarded on each side by gentlemen attendants, fifty in number, with gilt battle-axes. In the ante-chapel, next the hall where we were, petitions were presented to her which she received most graciously. This occasioned acclamations of 'God save the queen Elizabeth.' She answered it with 'I thank you, my good people.' In the chapel was excellent music. As soon as it and the service were over, which scarce exceeded half an hour, the queen returned in the same state and prepared to go to dinner.

"While she was at prayers, we saw her table set out with the following solemnity: A gentleman entered the room bearing a rod, and along with him another who had a tablecloth; after they had both kneeled three times with the utmost veneration, one spread this upon the table, and after kneeling again, they both retired. Then came two others, one with the rod again, the other with a salt-cellar, a plate and bread; when they had kneeled as the others had done and placed what was brought upon the table, they, too, retired with the same ceremonies. At last came a maiden of great beauty, dressed in white silk (we were told she was a countess), accompanied by a matron bearing a tasting knife; who, when she had prostrated herself three times in the most graceful manner, approached the table and rubbed the plate with bread and salt with as much veneration as if the queen had been present. When they had waited there a little while, the royal attendants entered bareheaded, clothed in scarlet, with a golden rose upon their backs, bringing in at each turn a course of twenty-four dishes served in silver. These dishes were received by a gentleman in the same order they were brought and placed upon the table, while the lady taster gave to each of the attendants a mouthful to eat of the particular dish he had brought, so that there should be no sus-

picion of any poison. During the time that these attendants, who consist of one hundred of the tallest and stoutest men that can be found in all England, carefully selected for this service, were bringing dinner, twelve trumpets and two kettledrums made the hall ring for half an hour together. At the end of all this ceremonial, a number of noble maidens appeared, who, with careful solemnity, lifted the food from the table and conveyed it into the queen's inner and more private chamber. Here the queen chooses for herself what she wants, the rest goes to the ladies of the court. The queen dines and sups alone, with very few attendants, and it is very seldom that anyone, foreigner or native, is admitted at that time, and then only at the special intercession of some nobleman."

The number of persons attached to the court seems to have made a great impression on the German visitor, and it well might. Officials, attendants, guards and servants of various degrees numbered some 1,500, and nearly a thousand were regular members of the queen's household. They were of every grade of dignity: holders of the great offices of state, gentlemen attendants with their gilt halberts, burly guards with gold roses on their backs, maids of honor, officials and servants, down to those of the most menial occupations. The organization of the court in its main outlines had come down from a remote antiquity, becoming more complex and more numerously attended with the increase of wealth, luxury and ceremony. A long list of departments, the queen's chamber, the stable, the revels, the larder, the kitchen, the pantry, the woodyard, the bakehouse, the laundry, the spicery, the scullery, the hounds, the hawks, and half a score others, each had its corps of gentlemen, yeomen, clerks, grooms, boys and other servitors. It was like a great modern hotel, or steamship, or public institution, except that it all centered around the queen, and it was permeated with the sense of antiquity, tradition, privilege, and the realization that it was the government of England as well as a domestic establishment.

There were very few women at the court of Elizabeth. She

was not like Tennyson's "Princess," who "loved to live alone among her women." Far from it. She liked men much better. Even the cooks, launderers and servants in the buttery and scullery were men, not women. Occasionally a nobleman or great minister had his wife or daughter staying at court with him, or a woman of high rank became an inmate of the court at the invitation of the queen, but for the most part the women of the court were only ten or twelve gentlewomen of the bed chamber, five or six maids of honor and a few in much humbler positions. The whole number was seldom greater than twenty or twenty-five. Lady Stafford, Lady Carew, Mistress Elizabeth Clifford, Mistress Margaret Willoughby, Mistress Lettice Knollys, and a very few others are the only women mentioned in a long list of courtiers of the early part of the reign. Just at the end of the queen's reign there were twenty-eight ladies attached to the court, three of whom were the maids of honor.

Before leaving Hentzner's description of the court as he saw it, it may be worth while to stop a moment to notice his statement that every dish brought in for the queen was tasted by one of her attendants before being taken to her for fear it might contain poison. At first thought, it is almost incredible that at so late a period as this and in such an enlightened country the fear of poison should be a reality. But such was the fact. More than one man was executed on suspicion of having intended to poison Queen Elizabeth. Her private physician, Dr. Roger Lopez, was charged with an attempt to assassinate her by rubbing poison on the pommel of her saddle and put to death. The son of the Earl of Pembroke was suspected of having poisoned his father, Leicester was thought to have tried to murder his second wife by poison in order to marry Lady Essex, who was believed at the time to have poisoned her first husband. Drake was then and still is believed by continental writers to have been poisoned by his attendants on his last voyage. The records of the courts are full of instances of servants charged with putting ratsbane in the food of their mistresses, and wives in that of their husbands. Men who had

been educated in Italy scarcely ever escaped the suspicion of being too familiar with the use of poisons. Much of all this was doubtless empty suspicion, but real cases were quite numerous enough to explain why the queen's food was tasted before she ate it and to justify Shakespeare in making poison play a part in so many of his plays.

The twenty-four dishes brought in at each course by the queen's attendants were also typical of the time. The sixteenth century was a period and England was a country of gross feeding. The more abstemious and refined foreigner stood aghast at the habits of Englishmen. Some instances will show this. The various high officials had their regular allowances of food at court. The lord steward's allowance provided at each meal for a first course of three kinds of meat, capon or rabbit, custards and fritters; a second course of lamb or kid, larks, plovers or pigeons and either tarts or fritters. For each meal he had butter and eggs, four sorts of bread and four gallons of beer or ale. On Wednesdays and Fridays, which were fast days, the first course consisted of six, the second of three kinds of fish, with two tarts, eight dishes of butter and twenty-five eggs. Besides this provision there was an allowance of so many loaves of bread and so much ale and wine to stay hunger between meals. Sometimes the allowance was made by the year. In 1574 the treasurer of the household received twenty-two fillets of beef, nine bucks and does, thirteen lambs, two sheep, eleven gammons of bacon, six pieces of pork, nineteen capons, nine cocks, five geese, two turkeys and three calves' feet, as his annual allowance.

The queen's usual meal consisted of beef cooked in three ways, veal cooked in two ways, mutton cooked in four ways, capon, chicken, rabbit, swan, heron, snipe, quail and curlew, besides the usual accompaniments. An estimate of "Her majestie's Diet for Dynner with the particular prices thereof," which still remains in manuscripts with Lord Burleigh's annotations, mentions seven kinds of meat, six kinds of domestic poultry and eight varieties of wild fowl, custards, tarts and wardens, four

gallons of beer or ale and three pints of wine as the queen's regular dinner. This meal cost £6, 10*s*, equaling perhaps $150 in modern value. The regular Star Chamber dinners eaten by the ministers present at the meetings of that court cost an average of $30 for each person at the table. It must be remembered, of course, that these meals not only fed the person to whom they were charged and who ate what he liked from them, but doubtless a great number of servants, attendants and hangers-on of various degrees ate what was left. Very little food may have gone actually to waste. Yet, even after the lapse of three centuries, it sometimes makes the blood flow hot to read the records of this gross excess, gourmandry and waste at court while the queen's soldiers were starving in the field, the brave sailors who had fought the Spanish Armada, dying for lack of proper food, in the seaports not fifty miles away, and the miserable populace of the slums of London festering in pestilence and famine not five miles from the scene of the feasting and frivolities of the queen and her courtiers.

Turning from Hentzner's account, we get another glimpse of the queen and the court through the eyes of Sir James Melville, the Scotch Ambassador. He gives a long narrative of his experiences there when representing Mary Queen of Scots in her younger and happier days. I can quote but a few of the more intimate passages.

"The queen, my mistress, had instructed me to leave matters of gravity sometimes, and cast in merry purposes, lest otherwise I should be wearied, she being well informed of that Queen's natural temper. Therefore, in declaring my observations of the customs of Dutchland, Poland and Italy, the clothing of the women was not forgot, and what country's dress I thought best becoming gentlewomen. The Queen said she had clothes of every sort; which every day thereafter, so long as I was there, she changed. One day she had the English dress, another the French and another the Italian. She asked me which of them became her best. I answered, in my judgment, the Italian dress; which answer I found pleased her well; for she delighted to

shew her golden colored hair, wearing a caul and bonnet as they do in Italy. Her hair was more reddish than yellow, curled in appearance naturally. She desired to know of me, what color of hair was reputed best; and whether my queen's hair or hers was best; and which of them two was fairest. I answered, the fairness of them both was not their worst faults. But she was earnest with me to declare which of them I judged fairest. I said, she was the fairest queen in England, and mine the fairest queen in Scotland. Yet she appeared earnest. I answered, they were both the fairest ladies in their countries; that her majesty was whiter, but my queen was very lovely. She enquired which of them was of highest stature. I said, my queen. Then, saith she, she is too high, for I myself am neither too high nor too low. Then she asked what kind of exercises she used. I answered, that when I received my dispatch, the queen was lately come from the Highlands hunting; that when her more serious affairs permitted, she was taken up with the reading of histories; that sometimes she recreated herself in playing upon the lute and virginals. She asked if she played well. I said, reasonably for a queen.

"That same day after dinner my lord of Hunsdon drew me up to a quiet gallery, that I might hear some music (but he said that he durst not avow it) where I might hear the queen play upon the virginals. After I had hearkened a while, I moved the tapestry that hung before the door of the chamber, and seeing her back was toward the door, I entered within the chamber, and stood a pretty space hearing her play excellently well. But she left off immediately, so soon as she turned about and saw me. She appeared to be surprised to see me, and came forward, seeming to strike me with her hand; alleging she used not to play before men, but when she was solitary, to shun melancholy. She asked how I came there. I answered, as I was walking with my lord Hunsdon, as we passed by the chamber-door, I heard such melody as ravished me, whereby I was drawn in ere I knew how."

The last events recounted by Melville, like the scene de-

scribed by Hentzner, took place when the court was at Greenwich on the Thames a few miles below London. But the court was not always in one place. On the contrary, it was distinctly a peripatetic body. The queen possessed half a dozen favorite dwelling places, all within a few miles of London. Among these shifting was constant. After a few weeks or possibly months of stay at Greenwich, Richmond, Whitehall, Oatlands or Nonesuch, the court was broken up and moved to one of the others according to the queen's judgment or whim.

On such occasions the work of the harbingers began. Among the prominent court officials were a knight harbinger, four ordinary harbingers and thirty yeomen of the crown who acted as messengers. It was the duty of these officials to go ahead to the place where the court was to be established, and secure in the vicinity of the palace lodging for all court servants and officials who could not be accommodated in the queen's own house there. Nowhere, of course, could the palace itself furnish living room for all. Ministers of high rank, ladies and personal servants must be accommodated in the queen's house or court proper. The rest of the vast number of those attached to the court must in some way be housed outside. The town of Richmond, Greenwich or Westminster, which had lain quiet and half-deserted since the last stay of the queen there, was now to be inundated with a horde of officials, servants, suitors and hangers-on, and it was the work of the harbingers to distribute lodgings among these, to issue billets for them, and to see that no one not having some proper connection or business with the court should be admitted into any inn or lodging-house in the town where the court was established.

In such towns as Westminster, or even Greenwich, there was abundant room for the followers of the court, but in some other places the accommodations were not so satisfactory. A foreign visitor in 1592 found the queen and court at Reading and describes a very different scene. "The country in the vicinity of the royal court is for the most part flat and sandy, and because few succeed in finding accommodations at an inn, they erect

tents under which they sojourn, thus presenting the appearance of an encampment." Another traveler describes a similar scene at Oatlands, "where the common servants of the court had set up their tents like a military camp, there being not enough lodgings."

Arrangements for such a removal having been made ahead, the household was broken up, the better furniture, tapestries, utensils, dishes and clothing packed, leaving little but bare walls during the absence of the queen; wagons were impressed from the adjoining country for the removal of the impedimenta, and all these things were carried off across country to their next destination, as many as three hundred or four hundred carts often following the procession of courtiers. London alone was required at one time to provide two hundred carts each with two horses to carry the effects of the court from Whitehall to Greenwich. A regular assignment of a number of carts for each official and each branch of the household was made by the lord steward. Eighteen were allowed for the wardrobe of the beds, fourteen for the jewel coffers, eight for the robes, three for the cellar, ten for the kitchen, three for the scullery and so through the various offices; seven carts were assigned to the lord steward, five each to the lord treasurer, chancellor and secretary, four to the treasurer of the chamber; some of the court ladies had two carts apiece, some one, some had to share one between them; the musicians, the chaplains and the queen's steward had one each. The sight of such a train streaming along the roads of Kent or Surrey or through the streets of London would give a fairer impression of the patriarchal character of the queen's establishment than any verbal description in my power.

The court was indeed in many ways like a great family. A number of its members were related to the queen. Lord Hunsdon and Sir Francis Knollys, one lord chamberlain and the other lord treasurer of the household and both privy counsellors, were first cousins of Elizabeth, one by blood, the other by marriage. The Earl of Essex, master of the horse and her prime favorite, was her second cousin. Lord Buckhurst, Lord

Howard, Lord Derby and the Earl of Worcester were also of the queen's kinship, and Sir John Perrot, if rumor and trick of physical feature could be relied on, was nearer than any, being her own illegitimate half-brother. There were many intermarriages. Three ladies closely connected with the court, Frances Walsingham, Lettice Knollys and Penelope Devereux, by their numerous marriages and marriage intrigues served to bind a considerable number of the courtiers in more or less decorous bonds of relationship or affinity. Frances Walsingham married successively Walter, Earl of Essex, Robert, Earl of Leicester, and Sir Christopher Blount; Lettice Knowles married first, Sir Philip Sidney, second, Robert, the younger Earl of Essex, and third, Sir Francis Bacon; Penelope Devereux was long enough in love with Sir Philip Sidney to inspire some lovely sonnets, but married Lord Rich, and then Charles Blount, Lord Mountjoy, by whom, however, she had several children before their marriage and who was her mother's brother-in-law.

On the whole, Elizabeth had some reason for her well-known deprecation of the marriages of her courtiers, though her habit of seeing to it that the course of their true love never did run smooth was itself not without responsibility for many of the troubles and scandals of her reign. The Acts of the Privy Council and other records also testify to the existence of many unfortunate and long-continued quarrels between husband and wife which had their origin in the mercenary, social or political basis of their marriage.

The scandals of Elizabeth's court are a voluminous part of its records, but not a part which interests very much the present lecturer, nor which has influenced very deeply the course of history. It may be enough to say that if this was the period, as the title of a modern novel suggests, "When Knighthood was in Flower," the bloom was not always a lovely one; and that the Elizabethan dramatists in making human frailty so large a part of their plot were doing no more than, as they claimed, holding the mirror up to nature.

A natural result of the family relationships among the courtiers was a large amount of nepotism. Sons and nephews of men in office were naturally favored. Just as a considerable number of those who held office in the early years of Elizabeth were descendants of men who had been in her father's service, so their descendants later came into office and the Tudor bureaucracy bade fair to become hereditary. Thomas and Robert Cecil were sons of Lord Burleigh, and Anthony and Francis Bacon were his nephews, as well as sons of the old lord keeper Bacon. Essex was introduced at court by his stepfather, Leicester, and there are numerous other instances.

These relationships and instances of favoritism combined with influences of temperament and interest to group the men surrounding the queen into factions. The Cecils and Howards against the friends of Essex, the Norrisses against the Knollys, Sir Walter Raleigh against his rivals, and many other factions and temporary intrigues divided the courtiers, fretted the queen and weakened the government. The greater ministers for the most part rose above these quarrels, but they played a conspicuous part in the routine of court life and increased in bitterness in the later years of the queen's reign. Elizabeth's court was not characterized by high-mindedness or appreciation of the more delicate sentiments of life, and if actual violence and disorder were repressed, and if there was less open immorality than in some of the other courts of Europe, it was nevertheless filled with petty jealousies, conflicts and intrigues.

Many of these intrigues were for the sake of obtaining office. It is astonishing what petty offices and slender additions to income were thankfully received even by great nobles and gentlemen. The Earl of Warwick was master of the buck-hounds with a fee of £50 a year, the Earl of Huntingdon of the hart-hounds with a fee of £13, 6*s*. 8*d*. Ralph Bowes, one of the gentlemen pensioners, was master of the queen's bears, bulls and bandogs, and after his death this position was given to John Darrington, another gentleman pensioner. There is equal struggling in the lower ranks for the offices of sergeant of the pantry and of the

poultry, clerk of the kitchen, groom porter, sergeant of the hawks, and taker-up of spaniels. Just as some great courtier may be fortunate enough to obtain a pension of £100 a year for life, so we find Andrew Rose, in September, 1589, granted six pence a day for life for filling the office of her majesty's mole-taker.

In appointments to the higher offices and for more responsible service, Elizabeth took ability into consideration, though the element of capricious preference was always present, constantly weakened her policy, and in several cases had calamitous results. The grant of lesser positions, pensions and rewards was governed by favoritism and personal influence alone. Such grants were regularly procured by officials of the privy chamber, and by the various secretaries and clerks, and regular payments were made to them for the service. Sometimes this practice verges closely upon bribery. On the death of Sir James Crofts, comptroller of the household, in 1590, Sir Thomas Shirley somewhat shamefacedly asks Burleigh to use his influence with the queen to obtain this office for him, and adds, "My thankfulness to your lordship shall be 500£, besyde my everlasting servyce which I am already bound to your lordship, . . . for I see that those which doe not offer themselves in this world are seldom advanced. I blushe indeed to make this motyon, but that I trust so much in your lordship's favor toward me."

There is no more common note in Elizabethan literature than the uncertainty, the caprice, the cost and the hollowness of court favor. Even so fortunate and so self-contained a man as Sir Robert Cecil writes to Sir John Harington: "Good knyght, rest content and give heed to me that hathe sorrowed in the bright lustre of a courte, and gone heavily even on the best seeminge faire grounde. . . I know it bringeth little comforte on earthe, and he is, I reckon, no wise man that looketh this waye to heaven."

The poet Spenser, notwithstanding his £50 pension and his grant of lands in Ireland, spoke evidently from personal experience when he wrote:

Full little knowest thou that hast not tride,
What hell it is in suing long to bide:
To loose good dayes that might be better spent;
To wast long nights in pensive discontent;
To speed to-day, to be put back to-morrow;
To feed on hope, to pine with fear and sorrow;
To fret thy soul with crosses and with cares;
To eate thy heart through comfortlesse despaires;
To fawne, to crowche, to waite, to ride, to ronne,
To spend, to give, to want, to be undonne.

Such were some of the characteristics of the court and of the courtiers. What shall we say of its mistress? What kind of a woman was Elizabeth, around whom this court gathered? For after all, the court was but the household of the queen. There was no doubt about her position in it. She was the perpetual center around which it revolved. Daily and nightly, ceremony, state and formality held sway. It was not the precise and pompous ceremony of a later day; like all else, court ceremonial was still inartificial. But it was none the less real and extreme. When the queen visits a country house its mistress receives her at the threshold "moste humbly on her knees." When the House of Commons visit her at the close of the session they kneel during her long address. We have already seen the queen as she appeared to one foreigner who saw her in her court at Greenwich, all who spoke to her kneeling until she raised them with her hand. Another traveler, visiting England in 1585, describes the nobles kneeling on one knee while they conversed with her, and men and women falling on their knees as she passed. Elizabeth loved this abasement of manner. The Duke of Stettin, who visited her in 1602, records, "At last the queen to show her royal rank ordered some of the noble lords and councillors to approach and they in their stately dress were obliged to remain on their knees all the time the queen addressed them."

Sometimes obsequiousness to the queen went so far as to rouse the ridicule of the courtiers themselves. An observer tells how "Dr. Dawson, of Trinity College, Cambridge, preach-

ing at Paul's Cross, kept on his velvet night cap all the while he prayed until he came to name the Queen, and then off went that, too; when he had spoken before both of and to God with it on his head." Some noblemen and gentlemen could ill brook this servility, and systematically stayed away from court to avoid it. This was true of Lord Willoughby, of whom a contemporary says, "He was none of the reptilia and could not brook the obsequiousness and assiduity of the court." Sir John Perrot was notoriously averse to courtly ways and risked disgrace when he was lord deputy in Ireland by speaking in rude and unseemly terms of the queen. Essex ventured still further by showing disrespect even in her presence. In the midst of a discussion when Howard, Cecil and Windebank also were present, Essex became so impatient at the queen's insistence on views of which he disapproved that he suddenly and rudely turned his back on her. Her resentment took the characteristic form of a prompt box on the ear of the presumptuous courtier and an adjuration to go and be hanged. Essex in turn put his hand to his sword, and although immediately stopped by Howard, declared with an oath that he would not put up with such an indignity if it had been Henry VIII himself who had inflicted it, and rushed away from the queen's presence and the court. This was an extreme case, but Essex showed frequent impatience of the necessity for such submissiveness. He declared of the queen that he would "never serve her as a villain or a slave," and asks, "Cannot princes err? Cannot subjects receive wrong?"

Physically, Elizabeth was a woman of medium height, though her erect figure and vigor of movement made many people think of her as tall. Her activity and endurance were great and her health almost constantly good. She was always impatient of her ailments, such as they were. Secretary Cecil, writing to Essex that the queen was unable to sign a certain letter, says, "The queen hath now a desperate ach in her right thomb, but will not be knowen of it; nor the goute it cannot be, nor dare not be, but to signe will not be indured." Again we hear of her

with an inflammation of the chest, and "her mind altogether averse from physic."

Pictures of her show the familiar smooth, somewhat retreating forehead, arched brows, narrow face, long profile of nose and chin, light eyes and hair. Contemporary writers describe her more vividly. Her sharp eyes and features, loud voice, vivacious manner and constant activity are repeatedly mentioned. She was her father's own daughter and played the queen well. It was not only her native flatterers speaking in her presence, but foreign visitors in their private correspondence who described her royal manner. One speaks of her "terrible eyes," another of her "stately air," and a third of her "majestic deportment;" a foreign ambassador is daunted by her anger and leaves her presence in confusion; a courtier records that "When she smiled it was a pure sunshine that everyone did chuse to baske in if they could; but anon came a storm from a sudden gathering of clouds, and the thunder fell in wondrous manner on all alike." One time in a discussion with Walsingham she took off her slipper and threw it at him, aiming with more than usual feminine success, as it struck him full in the face.

Her usual manner, however, was pleasant and affable, sometimes even insinuating. Many of her courtiers she called by their first names, several by fanciful nicknames she had fastened upon them. Foreigners she often flattered by speaking to them in terms of intimacy and confidence. She was often merry, not infrequently uproarious, easily pleased by the coarser forms of humor. "Her Highnesse loveth merrie tales," is the testimony of a courtier. One gets a glimpse of her in the midst of the Armada campaign, laughing to excess at the clown Tarleton playing the god Luz, armed with a flitch of bacon for a shield and a long staff for a spear, pretending to fight with the queen's little pet dog Perrico de Faldas and appealing to her to "call off her mastiff." She expressed her humorous feelings with disconcerting frankness. Sir John Harington, her godson and long-time courtier, records in his memoranda, "The queene

loveth to see me in my last frize jerkin—she spit on Sir Matthew's fringed clothe, and said 'the foole's wit has gone to ragges.' Heaven spare me from suche jibing."

It is hard to judge of Elizabeth's religion. She was certainly not devout. She seldom talked or apparently thought of religious matters, paid scant respect to clergymen, and took no interest in the church controversies of the time, except when they became matters of state. On the other hand, she was regular in all formal religious observances, her state papers are full of expressions of recognition of her position as a Christian ruler, and she shared in the practice of pious appeal and ascription usual at the time. She even composed certain eloquent prayers for public uses. But her devotion was quite impersonal. In her times of depression she sought her consolation rather in the classics than in the Bible. Harington remarks, "Her Highnesse was wont to soothe hir ruffled temper with reading everye mornynge. . . . She did much admire Seneca's wholle-some advisinges, when the soul's quiet was flown awaie." When her ally Henry IV changed his religion she found refuge and comfort in translating Boethius' "De Consolatione Philosophiae." A contemporary though hostile writer expresses what is probably a correct judgment of her belief, when he says, "She considers it of first importance that she should live peacefully and pleasantly and pass her days in well-being. She is not greatly influenced by either hatred or love of any particular religion or sect."

She was, however, thoroughly patriotic. As a matter of temperament she was a genuine Englishwoman and looked at everything through English eyes. When a Polish ambassador in a Latin speech before her and the court spoke contemptuously, as she thought, of her subjects, she sprang up with flashing eyes and berated him roundly in the same language he had used, closing with *valeas et quiescas*, then turned to her attendants and said, "God's death, my lords, I have been enforced this day to scour up my old Latin that hath lain long rusting." A contemporary declares that "she was resolute and of an un-

daunted spirit," and her own boast was equally true, "I am a prince that never can indure a menace at my enemy's hand."

Elizabeth's intellectual powers were moderate. She had been thoroughly educated in her youth and retained the habit of reading through her whole life. Translations from Horace, Plutarch, Boethius and Xenophon still remain in her own handwriting to testify to her interest in the classics. Although she sometimes displays in these translations a royal disregard of rhythm and even of accuracy, they give no mean impression of her ability in the use of both her own and the classical languages, a power of which we have abundant other proof. Besides those that remain, we know she made translations of many letters of Cicero and Seneca and the whole of Sallust's Jugurthine War and some parts of Euripides, and most of this was done in the later years of her life. Some of her speeches, letters and prayers were vigorous and picturesque, and like most other educated people of her time she wrote some poetry. On the other hand, nothing exists to show that she had any real appreciation of the higher learning, thought or poetry of her own time.

She showed little originality or power of initiative in statesmanship. All bold or constructive ideas of her reign came from her ministers or from entirely outside the government. Moreover, she was slow to respond to such ideas. Unimaginative and opinionated, she never understood the great questions, realized the great crises, or perceived the great possibilities of her position. As Raleigh said of her, after her death, she "did all by halves."

She was a hard mistress to serve. Irresolute and yet obstinate, she frequently refused to act or decide, procrastinated, delayed, hesitated, while her ministers watched disaster approach or opportunity vanish. Even her most influential advisers found it impossible to overcome this inveterate trait of indecision. Their correspondence shows them driven almost to despair in times of exigency at the queen's vacillation and unreasonableness. An endorsement by a clerk on a letter of

1600 still exists in faded handwriting to testify to this habit. "A letter which Her Majesty willed me to write to her Secretary, and to send it by post, but before I had fully ended the letter she sent to me to bring it to her before it was closed, which I did upon the point of six o'clock, and then Her Majesty having read and scanned it three or four times and sometimes willing me to send it away, and sometimes altering that purpose, commanded me at last to stay both the letter and the post."

Occasionally even her most devoted servants lost patience at being held responsible for her vacillation and its results, as in a letter of Burleigh to Walsingham, November, 1588, "All irresolutions and lucks are thrown upon us two in all her speeches to everybody. The wrong is intolerable."

Elizabeth had few generous impulses. No one of the great men of her time, in literature, learning, civil, military or naval life was fully recognized or adequately rewarded by her. She was occasionally liberal to her favorites, but never lavish, except for her own personal adornment or gratification. While her mariners and soldiers starved, her unpaid servants suffered and patriots found themselves neglected or disowned, her signature was being affixed to warrants for £1,700 for a pearl chain for herself, or £1,200 "for a great diamond with a pendant," or "£761, 4*s*, 4*d* for fine linen for her Majesty's own person."

But in matters not involving money or serious sacrifice on her part, she often spoke or wrote kindly and thoughtfully, as in a letter of condolence to Lord and Lady Norris on the "bitter accident" of the death of their two sons in Ireland; or one to the Earl of Pembroke addressed to "My very good old man." Occasionally we get a still more attractive glimpse of her, as for instance yielding to the persuasions of her maid of honor, Bridget Carew, to pardon an offender, or pinning up the dress of the little Lady Talbot, kissing her and taking her with her in the state barge. In a very real sense also she was conscientious. As the lord keeper of the great seal testified of her, "Shee wyll have her wyndinge sheete unspotted."

In estimating the abilities of Elizabeth it must be remembered that her experience was less varied than might at first thought be supposed. Except for her brother and sister, she was the first English monarch in the long line since the Norman Conquest who had not crossed the Channel. She never saw Scotland, Ireland, or Wales, and during her seventy years of life was never more than one hundred and twenty-five miles from her birthplace. She was even more than other sovereigns deprived of the stimulation that comes from open discussion with others on an equal plane. Without parents whom she knew, husband, brother, sister or child, habituated from girlhood to caution, reticence, deceit and concealment of her real opinions, separated from all others by her position, she lived alone, though in a crowded court, and never spoke to others or heard speech from them such as they used to one another. Most of the praise and some of the blame directed toward her came to her ears; but it all came through artful and indirect ways, and she was seldom called upon to justify the one or to defend herself against the other. Such success as her administration attained was in spite of her deficiencies as a ruler rather than a result of her abilities. From repeated dangers the country was extricated only by good fortune, and golden opportunities in a long series were wasted largely by the queen's incapacity to see them or unwillingness to make use of them. And yet after all this criticism one cannot but acknowledge that she did much of her work well. It will always remain impossible to give a complete analysis of Elizabeth's character. A writer of the next generation says, "For her own mind, what that really was, I must leave, as a thing doubly inscrutable, both as she was a woman and a queen." But her mind was trebly inscrutable, because of its complexity. Stripped, however, of the flattery and the abuse of her own time, and tested as far as possible by what she did and said, Elizabeth stands an unlovely but not an unheroic figure; exasperating to those who had to work with her and to the modern student who has to trace her tortuous career, but so thoroughly representative of her own age, so many-sided, so

queenly, so long the occupant of a throne, and above all so fortunate, that the extravagant laudation of her own time and the tradition of her greatness that has survived are easily comprehensible, however they may fade away on greater familiarity with her personality and her policy.

At the beginning of this lecture I said that its justification might be found in such gratification as it could give to the invincible desire of mankind to know everything. And the search for truth is in itself sufficient excuse for study and the results of study. But as one turns over the faded manuscripts of this long dead past as they lie stored away in the British Museum or the Record Office or other depositories and strives to piece together again the mosaic of the times that are gone, he cannot but wonder whether there is not some advantage for today to be drawn from them. Of direct instruction as to how to act now, they have little or none. Things are seldom sufficiently alike in different periods to make the analogy of any direct value. Of models to imitate there are few. Most idols have feet of clay when looked at closely. Certainly there were no saints at the court of Elizabeth. It is only the dreamer who can look at the past through a rosy cloud and give to the figures that show so vaguely through the haze such forms as he would like them to have, or as his uncontrolled imagination endues them with.

But to one use at least the past can be put; it can be used as a basis of comparison with the present. If we should compare the England of Elizabeth with the England of today, what would prove to be the gains and the losses? Much advance has certainly been made. Self-government has been gained. Men can now govern themselves, and poor use as they sometimes seem inclined to make of this opportunity at least they are freed from the imposition upon them of autocratic or individual or class control. Freedom of religious belief has been gained. Men may follow their own judgment without persecution from queen or churchmen. Education has been released from ecclesiastical control. Never again, probably, will education

be limited, narrowed and confined by the ideas and interests of one class of the community supported by public authority. The human spirit, like the body, has been released from its trammels in a hundred ways.

The relations of men and women to one another are better than they were in the time of Queen Elizabeth. Sad as are the annals of our divorce courts and far as we still are from the highest ideals, men and women in their life together stand on a higher plane than they did three hundred years ago.

Man's power in transportation, in communication, in manufactures, in agriculture, in the attainment of comfort and pleasure has been almost infinitely increased. The narrowness, the restriction, the isolation, the crudity of life at the court of Elizabeth would be well-nigh unendurable to a modern man. The total wealth and economic power of modern England as compared with sixteenth century England is thousandsfold greater.

On the other hand, there are fields in which there has been little gain. In the distribution of wealth and the comforts of life, all that can be said is that there is perhaps a larger well-to-do middle class. The extremes are as far apart as ever. No contrast of the luxury of Elizabeth's court with the slums of Billingsgate or Eastcheap is greater, perhaps none is so great, as that between the West End of London and the East End. The gorgeous costumes of the courtiers of Elizabeth scarcely differ more, if at all, from those of the 'prentices and working women in the vicinity of London Bridge than do the tailor-made costumes of the men and women of the prosperous classes of modern London from the thin shoddy and cotton clothing of great sections of modern English working men. No one could look at the wan faces, narrow chests, sloping shoulders and tattered clothes of the masses of dock laborers of the river wards of London, as I did during the great dock strike two years ago, and not feel that whatever improvement a comparison between the England of Elizabeth and the England of George V may show, whatever the advances of modern over sixteenth century society, the material condition of the great body of the people

is a colossal failure. Low wages, irregularity of employment, absence of opportunity for a vast proportion of the nation is the burning disgrace of our age; and I see little or no appreciable advance since the age of Elizabeth.

Yet if improvement has not been made it has become possible. Largely as a result of the efforts of the laboring classes themselves, the conditions of life for certain large classes of workmen have been raised during the last half century to a higher plane. In parliament, parallel with the legislation providing for political emancipation and equality, has been passed in the last forty years a series of acts more or less socialistic in character directed toward the economic enfranchisement and advancement of the mass of the community. The present ministry and majority in the House of Commons have carried through far-reaching measures for national insurance, for the extension of factory laws and the rearrangement of taxation, and are just entering upon a similar transformation of the conditions of ownership and occupancy of the land. Mr. Lloyd-George, the leading spirit of the present government, has shown a clearness of view, boldness of planning and tenacity of purpose that seem well to fit him to be the leader of a social revolution corresponding to that which has taken place in the political world. Such a leader and such legislation would have been an impossibility in the days of Elizabeth. It seems, therefore, well within the bounds of a fair anticipation to believe that the time may not be far distant when a comparison of social conditions with those of Elizabeth's time may show a still more favorable balance on the modern side.

THE PHYSIOLOGICAL ACTION OF ALCOHOL

By Alonzo E. Taylor

Benjamin Rush Professor of Physiological Chemistry
University of Pennsylvania

I venture to present a popular discussion of the physiological action of alcohol, trite as it may appear at first thought, because personal experience with students as well as with laymen has convinced me that a clear understanding of this important subject is not a possession of even a goodly minority of cultivated persons. This is due in large part, I fancy, to the fact that the subject is usually presented in a controversial rather than in a scientific or judicial spirit. There are four uses of alcoholic beverages in history, ancient and modern: in ceremony; as an article of diet; as a drug; and as a narcotic. The use of alcoholic beverages in ceremonies, sacred and secular, is a most interesting historical subject; and were time at our disposal, I am sure it would be of advantage, as well as of enlightenment, to discuss the subject in detail. For us here it has but two bearings; firstly, that it seems to be certain that the ancient peoples regarded alcoholic beverages as articles of diet, and secondly, that even in connection with the ceremonial use of alcohol, it was clearly realized that excess constituted abuse.

The historical use of alcoholic beverages did not in the very beginning, we may be sure, rest upon any conception of their value as articles of food, but had rather a biological foundation. Every native people, practically, has discovered the use of some natural or concocted beverage or indulgence, the effect of which was regarded as desirable or beneficial. The series includes tea, coffee and cocoa, tobacco, alcohol, hashish and opium. Of these the first three (tea, coffee and cocoa) act in all probability as true stimulants; tobacco, hashish and opium act as narcotics. To these modern pharmacological chemistry has added others,

notably cocaine. A stimulant may be defined, in general terms, as a substance that increases the capacity for work in the unit of time, prolongs the time through which maximum work can be performed, or increases the efficiency of work, both muscular and mental. A narcotic is a substance that lowers sensibility or function. Three stages may be roughly defined in the action of a narcotic. In the first stage, there is a depression of the states of mind and body. In the second stage we observe pseudo-stimulation, exaltation and incoördination of various states of body and mind. In the final stage is more or less complete narcosis. Thus the initial effect of ether is simple reduction of the sense of pain and lowering of the plane of sensation to external stimuli. In the second stage is incoördinated physical and mental excitation. In the final stage, anesthesia. These three stages are to be observed in the action of alcohol, if taken in quantity sufficient to display the narcotic action of the substance. In the ordinary use of tobacco, the first stage of narcosis is alone to be observed.

Now the biological basis of the use of these stimulants and narcotics lies in the inability of the nervous system to meet the demands of the environment. Either the nervous system is below par, below the demands of the environment of the time and place upon the individual, the conditions of environment being normal and usual; or the demands of the environment are excessive, even for the normal or most capable nervous system. The ration of grog in the armies of a hundred years ago was for the purpose of allaying nervousness rather than for the purpose of stimulating the circulatory or muscular systems. The more extreme the demands of the environment upon the individual, the more prone is the subject to seek relief in the use of narcotics. Thus the world over, narcotics are sought for relief from sorrow, worry, poverty, pain and disgrace. Within recent times we have learned to what an extent professional criminals are addicted to strong narcotics. In the days that followed the earthquake and fire in San Francisco in 1906 the most pitiful instances of suffering that came to the attention of the attending physicians were

the drug fiends, the men and women addicted to the use of morphine and cocaine. One of these men, in the desperate gratitude that followed the gift of a small amount of morphine, told his story. He was a professional jewel thief, who spent a portion of each winter in San Francisco, disposing of the jewels in his possession. Knowing that he was stamped by the police as a professional criminal and therefore always in danger of detection, constantly living in the fear of arrest and in worry over the possible treachery of his pals, he found himself able to support his burdens only with the narcotic aid of morphine, which depressed his sense of fear and enabled him to face the dangers of his existence. This state of affairs holds true with the mildest narcotic, tobacco—it is but a question of degree. Tobacco pleases (apart from the taste and considered from the standpoint of its internal action), because it allays irritability, calms the mind, pacifies the emotions, depresses the sensations of fatigue and thus appears to rest and refresh the smoker. The pipe is truly the pipe of peace. Contrast with this the action of a true stimulant—in proper doses, coffee. Tobacco seems to stimulate because it depresses the sense of fatigue; coffee does not affect the sense of fatigue, but does actually give, for the time being, increased power. What is true of tobacco is still more true of alcohol, if taken in dose sufficient to exhibit its pharmacological action. The drunken man is proof to fatigue and free of care. It is necessary to understand this biological basis of the use of narcotics if we are to do justice at once to these substances and to their devotees. From this point of view, the increased use of narcotics in modern times becomes clear and inevitable. Our life has become strenuous past the dependable capacity of the average nervous system. From the same point of view, the extreme proneness of defectives to become drunkards or drug habitués is seen to be psychologically inevitable. The biological basis then of the use of narcotics lies in the inability of the nervous system to meet the demands of the environment. And herein lies the explanation of the constantly increasing per capita consumption of alcohol in the Caucasian races.

It is, however, necessary not to fall into error in the interpretation of the high figure for the present per capita consumption of alcohol. This does not mean that the consumption of alcohol in every adult individual had increased. On the contrary, there were probably never (within a century) so many abstainers as today. And among those who use alcohol in the usual and ordinary way, moderation is certainly on the increase. The amount of alcohol consumed by men in representative and political life is strikingly less than a generation ago, as will be testified to by every man who has been prominent in public affairs for a long time. Even in my own experience, the consumption of alcohol in club life is distinctly on the decrease. In the cultivated classes there has been advance in temperance in the use of alcohol. This has been overbalanced, however, by a marked increase in the use of alcoholic beverages in the laboring classes, which may be reasonably interpreted as an indirect result of the tense pressure of modern industrial life, the high cost of living and the exacting demands of the whole ultra-modern environment upon the nervous system. This does not mean that there is more drunkenness in laboring men. Men engaged in skilled labor are doubtless more abstemious than formerly. The increase of drinking in the laboring class as a whole is probably to be related to the great mass of foreign-born unskilled workers. One more factor among others has undoubtedly been potent in driving upwards the figure for the per capita consumption of alcohol, namely, the present use of alcoholic beverages by women. A generation ago few women touched alcoholic beverages at all, and this was restricted to the use of wine at the home table. Today the use of alcoholic beverages by women of all classes is so common as to provoke no comment, and is to be seen everywhere in public places. There is, of course, no social, sociological or pharmacological reason why women should not use alcoholic beverages as well as men, except for the fairly certain fact that the more highly strung nervous system of women, on the average, is more susceptible to narcotics than is the case in man.

The Physiological Action of Alcohol

It is not proper to open a discussion of the action of alcohol, even in the strictly physiological sense, without reference to the factor of alcoholism in society as a whole. Alcoholism is perhaps the most potent single cause of the cases of assault and battery, rape, suicide and homicide with which our courts are occupied. Alcoholism is a most frequent direct and indirect cause of poverty. It is a most effective cause of industrial inefficiency. The direct relation of alcohol to sexual disease will be mentioned later, and this is possibly the most damaging indictment that is to be formulated against this narcotic.

The use of alcoholic beverages as articles of diet is very old. Simply because a substance is an article of diet, it does not follow that it is a food stuff, since all diets contain many things consumed for the pleasure of taste rather than for their nutritional properties. Nevertheless, there seems to be no doubt that in the popular mind alcoholic beverages have not been classed with luxurious drinks, such as coffee, but regarded rather as energy-carrying articles of diet. A great stir was aroused several years ago when it was definitely proved, by the calorimetric studies of Atwater, that alcohol is burned in the body, yielding its energy much in the same manner, as sugar. But in the popular acceptation of this finding, and in the also widespread protest against it, lay a misconception. There is no doubt that ethyl alcohol is burned in the body, each gram yielding about seven Calories of heat. The heat thus afforded is utilized precisely as the heat obtained in the oxydation of sugar or fat; and in this sense alcohol can replace sugar or fat in the diet. But there are very important differences between sugar and fat on the one hand, and alcohol, as fuels. There is, in the healthy body, practically no limit to the amount of sugar or fat that can be burned in a day; no matter how great the production of heat associated with excessive muscular work, it is supported without difficulty by the combustion of either sugar or fat. In the case of alcohol, however, the powers of oxydation are limited, and the excess ingested is eliminated by the lungs and kidneys.

There is some evidence that a subject habituated to alcohol possesses greater powers of combustion of alcohol than does the normal individual; but limited the power of oxydation of alcohol always is. Mere conbustion is not in itself a full criterion of a foodstuff. Thus, acetic acid is easily burned in the body; carbolic acid even is oxydized in traces, as are innumerable foreign and pharmacological substances. In order to be termed a *food*, a substance must possess several qualifications. It must be combustible and available for substitution of other food. The use of the substance must, within the limits of normal and natural use, be devoid of deleterious action. The use of the substance as a food must be a material and substantial use, a use in such amounts, without injurious action, as to make it a substantial factor in a diet. Alcohol does not possess these qualifications. Alcohol cannot be ingested in such amounts as to make it a material and substantial factor in a diet, without deleterious results in the majority of instances. A good analogy is furnished by acetic acid, itself a direct derivative from alcohol. Acetic acid is easily burned in the human body. It is an article of diet, in the sense that it is an adjuvant in diet, it is used in cooking and as a flavoring substance. But no one would use it as a fuel for the heat units it contains, because to burn enough acetic acid to secure a material and substantial amount of heat would necessitate the ingestion of acetic acid, or of acetates, in such amounts as quite certainly to derange digestion. In a similar manner, such use of alcohol as to secure therefrom a material and substantial amount of heat would mean the ingestion of so much alcohol as to result in intoxication in the average individual. If alcohol be ingested only in such amounts as to be certainly below the limit of danger of injurious action, it ceases to figure as a material course of heat. In short, therefore, the experimental facts that ethyl alcohol can be burned in the body and can be used to replace other forms of fuel, does not suffice to make a food of alcohol, in the natural and proper sense of the term. Most persons who, for any length of time, attempt to use alcohol as a material source of energy in the

body, will meet with disaster. That alcoholic beverages in some instances contain foodstuffs is true. Thus, the malted liquors, especially porter and stout, are quite rich in sugars. But to suggest the use of malted beverages as carriers of sugar is absurd, since a pound of sugar can be purchased for a small fraction of the price of a bottle of stout, containing at the best but a few grains of carbohydrates.

At this point it appears appropriate to expose one ludicrous misrepresentation connected with the manufacture, sale and use of alcoholic beverages. This is the constantly prated insistence on "pure" liquors as against "impure" liquors. The now famous controversy between the "straight" and "blended" whiskeys was an illuminating illustration of humbuggery. Lately we have been informed that it is the duty of the government to see to it that the beer, upon which the working man is urged to subsist as much as possible, shall be pure. And in particular the nursing mother, who is sometimes supposed and often urged to drink beer to stimulate the secretion of milk, must have her welfare guarded by regulations that insure the manufacture of beer solely from American barley instead of partly from foreign rice. The misrepresentations that fill the advertisements in the public press in relation to this subject are nothing less than amazing. Whatever virtue lies in alcoholic beverages lies in ethyl alcohol; whatever harm lies in alcoholic beverages lies in ethyl alcohol. All else is hypocrisy. From the standpoint of pharmacology, the purest whisky of the royal cellar is identical with the rot-gut of the Barbary coast. What counts in each is the 55 per cent of ethyl alcohol. Even the factor of fusil oil, so often and so skilfully employed to befog the real issue, ceases to be of importance when we learn that although weight for weight it is about seven times as toxic as ethyl alcohol, it is present even in so-called straight liquors in such small amounts as be of little import. Alcoholic beverages must stand upon their own footing, and that footing is ethyl alcohol.

Even where the general use of alcoholic beverages as food-

stuffs was not regarded as indicated, they were often recommended as advantageous under certain circumstances. Thus, for the nursing mother, in tuberculosis, in states of anemia, in old age and in various conditions of debility, alcoholic beverages were once supposed to serve as particularly adapted foods. This is now recognized to have been an error. The narcotic action of alcohol was mistaken for a nutrient quality. There is no state of body, outside of true diabetes, where sugar does not serve every supposed purpose of alcohol; it is quickly digested, as easily burned and carries no possibility of deleterious action. It is possible that sugar is, in the body, burned through the stage of ethyl alcohol, as a transient, intermediary reaction-stage within the muscle cells; but this, even if established, has no bearing on the use of alcohol as a food or drug.

As a drug, either in the hands of physician or patient, alcohol has been in the past employed in a great variety of diseases. I have no desire to palliate the condemnation that was once deservedly placed upon the medical profession for its excessive, uncontrolled and unscientific use of alcohol as a drug. But it is at least worthy of mention that the amount of alcohol that has been prescribed by physicians is but a small fraction of the amount that patients have administered to themselves in the form of patent medicines. And whereas today the abuse, and almost the use, of alcohol as a drug has disappeared from the practice of the physician, the self-doctoring with alcoholic patent medicines continues. While many people were deeply shocked when they learned that the supposedly beneficial result they received from this or that patent medicine was merely a mild "jag," many more found the results so satisfactory to their sensations that they have continued in their ways. Alcohol has been employed as a so-called tonic, as a stimulant to digestion, to the heart and circulation, as a mental stimulant, as a fuel in diabetes and as a narcotic. Professedly as a narcotic, it has been little used by physicians. And yet the supposedly stimulating action of alcohol can be shown to be in fact narcotic. Two

special uses of alcohol in severe disease deserve a separate mention, namely, in bacterial infections and in diabetes.

Alcohol is not a stimulant to digestion, the cocktail to the contrary. It acts as a narcotic, allays the excitation aroused in our high pressure life, causes a sensation of warmth in the stomach as the result of dilatation of the blood vessels, and thus simulates stimulation. I am sure that any objective observer, not habituated to the use of the cocktail, will on test agree that the action of alcohol on the empty stomach depresses rather than stimulates appetite. It is not a stimulant to the gastric secretions, it does not accelerate the chemical processes of digestion; it is either narcotic, or has no measurable action. It is true the individual habituated to alcohol cannot digest his food as usual in the absence of alcohol. But in just the same manner the morphinist cannot digest his food without morphine. Yet no one would term morphine a stimulant to digestion. No, alcohol in no demonstrable way improves the chemical or motor functions of digestion.

The idea that alcohol is a cardiac stimulant is absolutely fixed in the popular mind. Let a person faint on the street or meet with an accident and alcohol is the first suggestion or offering of those who happen to be near. It is true that alcohol makes the heart beat faster. But excitation is not identical with stimulation. Alcohol does not increase the force of the contraction of the heart, it mars normal rhythm, it substitutes a wild incoördination for the normal control, it acts at the best like a whip. It lowers blood pressure, through dilatation of the peripheral blood vessels. Now when the data on this subject are carefully analyzed, it is seen that little of therapeutic use withstands criticism. It is probably true that in instances of acute failure of the heart alcohol may do good by acting as a whip. In the life of a heart, as in the life of a beast of burden, may arise moments of dire emergency, when only the cruel lash of the whip can provoke the crucial effort needed to save the situation. But this use of alcohol must be a very rare and restricted one. Certainly, as a cardiac stimulant in heart disease or in

other conditions where cardiac stimulation is indicated, this use will rarely find application. In conditions of profound intoxication with bacterial poisons, as in sepsis, alcohol seems for a few hours at least to serve a useful purpose in sustaining the circulation, though great caution must be used in its employment. Here again we are dealing with an extreme situation.

The vaso-motor relations of alcohol are of particular importance in connection with exposure to climatic influences. The dilatation of the peripheral blood vessels produced by alcohol tends to increase the dissipation of body heat. And since fever is due, in largest part, to faulty dissipation of body heat, the use of alcohol as antipyretic would seem theoretically indicated. In fact, it does tend to lower the temperature in fever. But since large amounts must be administered in order to effect a material reduction in the fever, the deleterious actions of alcohol appear in the foreground so obviously that this use of alcohol has been discontinued. The application of external cold is much more effective and is accompanied by improvement in the tone of the circulatory system, which is not the case with the use of alcohol. Since alcohol dilates the peripheral vessels, it would naturally seem that it should act agreeably in the tropics. But as a matter of fact, the contrary is the result. It is known to all travelers that drinking is particularly injurious to those living in the tropics. Upon those living within the polar regions the action of alcohol is very deleterious, since it aids that dissipation of heat against which the greatest efforts of the polar explorer are directed. The common use of alcohol to ward off a "cold" or to counteract a chilling is an illustration of confusing a sensation with an effect. Alcohol will not abort a cold. A cold is a bacterial infection, and whether or not a bacterial invasion succeeds in establishing an infection depends upon the powers of antibacterial reaction as against the virulence of the bacterium, and these are not enhanced by alcohol. On entering the house after exposure to external chilling, a drink of spirits will cause a sensation of warmth, through the dilatation of the peripheral vessels. These would have dilated.

though not so quickly, in the natural reaction to the warmer atmosphere of the interior. That the sensation of warmth following the drink of spirits is comfortable, may be admitted. But that the state of affairs a half hour later is better, or as good as would have been attained naturally, is very much to be questioned.

Alcohol has been praised in song and story as a mental stimulant. Many a poem has been supposedly composed under its influence; many an act of daring conceived and executed under its leadership; mathematical problems even are alleged to have been solved with its aid. Works of art are the products of imagination. That the function of imagination is unbridled in the state of alcoholic narcosis is all too true. And it is possible that compositions of a certain type might be evolved in the state of alcoholic intoxication. In fact, we are all familiar with works of art—in painting, fiction, poetry and music—that bear the stigmata of the alcoholized imagination. But it may be stated as certain that no notable work of art has ever sprung from alcohol. The imagination required for composition of high type is constructive; the flight of imagination let loose by alcohol is bizarre, incoördinated and unproportioned. Direct tests of alcohol as a mental stimulant have failed to yield evidence that under its influence the mind works better than in the normal. In fact, whenever the results can be regarded as anything other than negative, an actual loss of efficiency is to be observed in work done under the influence of alcohol. Efficiency means control, objectivity and order in mental processes; alcohol leads to loss of control, subjectivity and disorder. Excitation does not mean increase in apperception. In a similar manner direct experiments do not support the view that alcohol enables an individual to do an unusual amount of muscular work. It is the concordant opinion of men in charge of bodies of workmen—be they athletes, lumbermen, miners, firemen or soldiers—that the use of alcohol does not yield increased or prolonged muscular strength or make for greater efficiency. With the ingestion of small amounts of alcohol there is no dis-

cernible effect; if large amounts are ingested there is a loss in the results. It is true that a half-drunken man will attempt feats of daring and difficulty that would not be attempted by the sober man, and often with success in the undertaking. But the success is due to the fact that under the narcotic pall of the alcohol, the man loses fear, does not feel fatigue and is oblivious to consequences. The subject of delirium tremens will accomplish muscular feats of which the same individual, normally, would be absolutely incapable. The action of alcohol under these circumstances may be compared to tying down the safety-valve of a steam boiler. But the procedure is not to be recommended for either steam boiler or man. The sense of fatigue and the sensation of the limitation of muscular power are safeguards and they cannot be discarded with impunity. It is in particular in the operations with machinery that the injurious effects of alcohol are most strikingly observed. Working with machinery, absolute muscular control, mental circumspection and directness of effort are essential qualities; the action of alcohol is to lessen these functions. The "bracing" action of alcohol, so commonly sought by the overworked man at the close of the day, again illustrates the narcotic action of alcohol. The man is tired and the sensation of fatigue is depressing, mentally and physically. A drink of strong spirits seems to afford strength—it "braces." In reality, it has removed the sensation of fatigue from consciousness through narcotic action. But the purpose of fatigue is to warn, to suggest relaxation at the moment and reduction of work in the future, if the fatigue be excessive. It is only through the sensations of fatigue that one becomes conscious of the danger-line of overwork. Surely it cannot be good practice to stifle this sense by narcotizing it with alcohol.

Alcohol was long used in the treatment of infectious diseases, both acute and chronic. It was supposed to be a general tonic, a highly specialized form of fuel, an excitor to the digestion, a "toner" of the circulation, a stimulant to the heart; in fact, a man-of-all-work in combating an infectious process. This

widespread use of alcohol has long since fallen into disregard. Whenever one sees a long list of therapeutic properties ascribed to a substance, one may safely infer that it possesses few measurable qualities. Today alcohol is used practically in but two forms of infectious disease, in pneumonia and sepsis. And even in these conditions it is reserved for the periods of crisis, when life hangs upon a thread. Many competent physicians do not employ alcohol at all in the treatment of these diseases, and have not been able to observe any loss to their aramentarium. Granted for the sake of argument that under these circumstances the action of alcohol is favorable, this fact can furnish no basis for the general use of alcoholic beverages as therapeutic agents. Experimentation with lower animals indicates that the use of alcohol lowers the resistance of the body to bacterial invasion. And certainly, habituation to alcohol makes the prognosis of a case of infectious disease much more grave. The high mortality of infectious diseases in alcoholic subjects is noted in every hospital.

In the treatment of diabetes we find, in my opinion, the first clear-cut indication for the use of alcohol as a drug. In the diabetic organism, the power of burning sugar is largely or almost entirely lost. Lost to a dangerous degree also is the power of burning fat. This leaves but protein to serve as fuel. Now in the utilization of protein, sugar is formed. This sugar, burned in the normal organism, is not utilized in diabetes. So the diabetic body is indeed hard-put-to for fuel with which to maintain body heat. The imperfect combustion of the fats in diabetes leads to a state of acidosis (formation of fatty acids) in the body, and this tends to end in coma, which is usually fatal. Needed, therefore, in the treatment of diabetes is a substance that will act as a fuel to replace the sugar and fat, and thus reduce or obviate the acid intoxication. Alcohol is burned in the diabetic as in the normal subject. And when administered in diabetes, alcohol for a time often does act in accordance with the direct indications. In the long run, however, the use of large amounts of alcohol injures the individual

and seems to reduce still further the powers of normal combustion. Nevertheless, in the dire state of the functions of combustion in diabetes, this treatment remains a sound procedure.

Alcohol is widely used in chronic, incurable disease to produce a state of euthanasia. When the pain, restlessness and insomnia of chronic incurable disease are not pronounced enough to demand morphine, alcohol often acts to narcotize the subject sufficiently to make existence bearable. The difficulty lies in the fact that the patient often decides when this use of alcohol is justifiable, and begins its use many years before it is necessary.

This is the day, confessedly, of therapeutic nihilism, due to the standards of exact investigation that are now in control in laboratories of pharmacology and to the use of scientific methods of observation of the sick in the hospital ward. Perhaps no drug has lost so much prestige through cross-examination by modern pharmacology as ethyl alcohol. Alcohol is rarely mentioned as a drug in the modern school of medicine. In the hands of the physician it may sometimes seem indicated, in the conditions of disease previously discussed. As a drug in the hands of the laymen, it has no place. Let us have done with hypocrisy in this matter. If we drink alcoholic beverages, let us do so because we like the taste or the effect, and not pretend to self or to others that we drink for our health.

When we come to the question of the injuries committed by alcohol upon the users of alcoholic beverages, we approach a problem far more intricate and difficult than the question of the pharmacological properties of alcohol. The relations of alcohol cannot be measured except from the standpoint of physiological compensation and adaption. No point of view in physiology is sound that does not take into account, in every function, the faculties of compensation and adaptation. It is compensation and adaptation alone that make it possible for animals to live amid the constantly fluctuating internal and external factors of existence. There is no substance that is always poisonous. There is no substance that is always good. Ever and ever, the

reaction of an organism to a certain substance is one of degree. Sodium chloride, indispensable to all cells, has caused death when introduced into the colon in concentrated solution. Sodium, potassium and calcium exist in sea water, side by side. All are toxic to marine creatures outside of certain limitations. Within certain limitations, on the other hand, all are indispensable. Our life is a series of compensations and adaptations within wide ranges, in the complicated media of our existence. Thus, it is *a priori* an error to term alcohol an absolute poison, to assert that it is harmful whenever and however ingested. If we are to reason by analogy with other known substances, even apart from direct observation, we must realize that within certain limitations it must be harmless. And with this conclusion of analogy, direct observation is in accord. Now when we come to determine in what directions and to what extent the excessive use of alcohol injures the body, we must face the question of the dosage. Because the individual who suffers from a disease that might have been due to alcohol has of course been exposed to other agencies that might produce the disease. And when we attempt to weigh these various agencies against each other, we must have some conception of the dosage of alcohol. Dr. R. C. Cabot, of Boston, himself a teetotaler, in the course of a statistical study into the use of alcohol by the patients in certain Boston institutions, defined excessive drinking as follows: drinking before breakfast; drinking over three glasses of whiskey or over three bottles of beer per day. This is a fallacious point of view, in my opinion. It does not go far enough. The real test of excessive drinking should rest also upon the reaction between the drink and the body of the subject. I should say that whenever an individual drinks for the purpose of obtaining the narcotic effect and on cessation of the use of the accustomed dose, feels withdrawal symptoms, that individual is drinking to excess, no matter how small is the daily dose of alcohol. On the other hand, occasional men have consumed alcohol in notable excess of the amounts stated, from youth to old age, without a sign of mental, moral or physical injury. One great difficulty in estimating

the injuries that alcohol may inflict upon tissues lies in the fact that the narcotic action of the substance does not run parallel to the lesion-producing actions. The same Dr. Cabot has reported upon the autopsy findings in the bodies of several hundred victims of delirum tremens or other form of alcoholic insanity. He naturally expected, in the bodies of such excessive drinkers, to find the tissues, especially the livers, hearts and kidneys, badly diseased. He found these organs almost normal. In these unfortunates, the alcohol had expended its action upon the central nervous system. On the other hand, one sees advanced abdominal lesions in drinkers who have never used alcohol to intoxication and only in small amounts. Nor is it a question merely of time. It is a question of adaptation and compensation. There is, however, no question of one fact. The toxicity and organic injury of alcohol are inversely to the age of the individual. The majority of drunkards have the history of excessive drinking before twenty. A prominent worker in the slums, himself a reformed drunkard, has stated as the result of his personal observations that if the laws prohibiting the sale of alcoholic beverages to minors were enforced so that minors could not learn to drink, the largest fraction of drunkards would be saved their fate. But evil as alcohol is to an enormous number of men and women, it is not true to fact, physiological or psychological, to regard alcohol as a Circe who transforms into swine all who touch upon her shore. It is not true that alcohol is, in any dose, always a poison and an injury.

The ways in which alcohol injures are several and devious, and not susceptible of close identification or proof. The portal of entrance naturally first attracts attention. There can be no doubt that alcoholic beverages, especially spirits, may cause organic disease of the stomach as the direct result of the application of strong liquor to the wall of the stomach. From this point of view the taking of the cocktail upon the empty stomach is a direct provocation to gastritis, which it must be admitted, is often very long deferred. The consumption of excessive amounts of alcoholic beverages may cause dilatation of the

stomach. Dilatation of the stomach is quite common in Munich and other beer-drinking centers in Germany, and rare in youth except in beer drinkers. It is not so much the content of alcohol as the excessive bulk consumed that leads to dilatation of the stomach and of the heart as well, since the immense volumes of water must be pumped to the kidneys for elimination, and these organs too often suffer. But alcohol must bear the blame, because no one would consume such ludicrous amounts of any non-alcoholic beverage. An historian has recently called to my attention an old record of certain medieval cloisters in Germany, in which the daily ration of beer was thirteen litres for the monks and ten litres for the nuns. But even this would be a pittance to many German chor-students in the first year in the University, though of late the practice of forced beer drinking has fallen into disrepute in Germany. Our American students behave rather badly at times; but they have at least never made a fetish of beer drinking.

Cirrhosis of the liver was long the classical example of a lesion produced by alcohol. Nowadays, however, we observe this disease in persons who have never used alcohol. This of course does not prove that it is not caused by alcohol in drinkers. Nor does the non-occurrence of cirrhosis of the liver in many hard drinkers disprove the old idea of a casual relation. It is again the factor of adaptation and compensation. And certainly the disease may have different causes in different subjects. With all regard for the many positive instances of cirrhosis in teetotalers, even in children, there can be no doubt that alcohol is one of the causes of this grave disease—perhaps the most common cause.

The relations of alcohol to organic disease of the heart and blood vessels are still less definite. There is good evidence that alcohol can cause degeneration of the heart muscle and dilatation of the organ. But this does not seem to occur very commonly. With respect to the blood vessels, the old idea that alcohol is *the* frequent cause of arteriosclerosis, is difficult of demonstration and it is probably not correct. Aneurism was

once regarded as of alcoholic origin, a view that is now abandoned. Nephritis has long been regarded as frequently of alcoholic etiology, the alcohol undergoing elimination being held to act directly upon the renal tissues. Within recent years there has been some recession from this position. The most competent students of diseases of the kidneys do not now believe that alcoholic nephritis occurs as frequently as was formerly taught, though its occurrence is not to be denied. The onset of nephritis is often so insidious and the course of the disease so irregular, that exact judgment as to causation is impossible. It is amazing to what an extent the kidneys can withstand excessive drinking, as was noted in the autopsy records of Dr. Cabot, quoted above.

Alcohol seems to bear a certain relation to gout, though the subject is in a state of confusion. That it can seriously derange the metabolism is seen in the occurrence of alcoholic diabetes, so-called.

Indirectly, alcohol is a most potent cause of organic disease. Alcoholism, under conditions of poverty, leads to subnutrition —in the victim through the substitution of alcohol for food and in his unfortunate family through deprivation. Alcohol is a most potent cause of traumatism, to the innocent as well as to the intoxicated. But the most serious manner in which alcohol contributes indirectly to disease lies in the fact that in a very large number of instances sexual diseases are contracted in the state of intoxication by men and women who are otherwise controlled by self-respect. Each case of sexual disease so contracted may mean many more innocent infections through the medium of the ignorant victim. This feature of the sexual problem has been given special prominence in the play of Brieux, "Damaged Goods." It is one of the most serious features of alcoholism. Alcohol has ever been the weapon of the rake against the ignorant girl and of the prostitute against the hesitating boy. To keep boys sober means the prevention of many cases of sexual disease, diseases that may extend through years, involving innocent with guilty, to the ruination of fatherhood

and motherhood, and which if improperly treated may culminate in hopeless degeneration of the body and mind.

The influence of alcohol upon the nervous system is, both functionally and organically, often profound and far reaching. From acute delirium tremens to complete dementia, nearly all types of the common forms of insanity may be developed as the result of the excessive abuse of alcohol. Very important, but much less definite, are the relations of alcohol to degeneration and mental defectiveness. A couple of decades ago it was quite commonly believed that alcoholism in the parent could be transmitted directly to offspring, and that in addition alcoholism in the parent could breed a progeny of mental and psychical degenerations, such as idiocy, epilepsy and moral monstrosity. Today such direct transmission is not regarded as either proved or even probable. It does not seem possible to believe in the direct transmission of the appetite for alcohol. The true situation is probably just the reverse: the degeneration and defectiveness are primary, the alcoholism is secondary. That defectives almost inevitably become addicted to alcohol, if afforded opportunity, is now fully understood. The syphilitics of one generation provide alcoholics in the next generation. The evils of excessive use of alcohol by defectives are the more pronounced, since the natural powers of control are the less developed. A large number of cases of alcoholism, especially in the young, are cases of masked mental or moral defectiveness, and they should be treated as defectives rather than as drunkards. Periodic dipsomania is a form of mental derangement. Careful investigations into the mental and moral states of children have revealed to what a surprising extent mild degrees of defectiveness exist; thrown into the struggle for existence, probably a majority of these defectives become drunkards.

Our review having led us to the obvious conclusions that alcohol is not to be regarded as a food, that it is not a drug to be handled by layman and is of little importance in the hands of a physician, and that in the use of alcoholic beverages lie grave dangers of organic and functional diseases of serious import,

do these facts, for the physiologist, close the question of the use of alcohol? Is there a non-narcotic use of alcoholic beverages? Does the non-narcotic use of alcoholic beverages carry with it danger of injury? There certainly is a non-narcotic use of alcoholic beverages; it is, in fact, very common. Many persons partake of alcoholic beverages merely as luxuries of gustatory taste, just as they indulge in terrapin, game, French pastry and confections. Few people indulge in tea and coffee for the sake of stimulation, manufacturers of substitutes for coffee to the contrary; they drink coffee because of a liking for the taste of the beverage. Many persons use alcoholic beverages in an incidental and occasional manner, solely because of a luxurious liking for the rare or exotic flavors contained in certain drinks. The flavors of beers lie in bitters and extractives of malt, not in the five per cent of alcohol. The flavors of wines lie in esters and aldehydes, not in the ten per cent of alcohol. There is a striking difference in the regard for tobacco and alcoholic beverages by the mass of cultivated men. If we were to take a half hundred unselected men from our faculty club, or a hundred unselected men from the University Club or from any club or association of cultivated men, and ask the men who smoke how many would miss the weed on its withdrawal and ask the men who use alcoholic beverages how many would miss them if withdrawn, the answers would indicate that practically all smokers are habituated to tobacco in the narcotic sense, they would experience withdrawal symptoms, while only a small percentage of the men would notice the withdrawal of alcohol at all, they are not habituated to alcohol in the narcotic sense. The use of alcoholic beverages, especially of beer and wine, consumed as incidental luxuries and not for their narcotic properties is very widespread. Of this there can be no doubt and to refuse recognition to this fact will not advance the cause of temperance or teetotalism. In such use of alcoholic beverages the narcotic properties of the substance are not desired and are afforded no opportunity; the use is occasional and incidental, the amounts consumed are minimal and symptoms and sensations of nar-

cosis, even in the mildest degree, are not experienced. Is such a use of alcohol entirely innocuous and free of danger?

As previously stated, there are instances of the occurrence of organic lesions, presumably the result of alcohol, in individuals who have presented no signs or symptoms of the narcotic action of alcohol. It is, therefore, possible that even in connection with the occasional use of alcoholic beverages, organic injury might result. There are no data tending to indicate the actual occurrence of clearly definable alcoholic lesions in individuals who use alcohol solely as a luxurious adjuvant to a full course dinner. But the possibility of injury cannot be denied. Life insurance companies do not object to this degree of drinking; they do not regard the occasional and moderate drinker as in any way an unfavorable risk. Nevertheless, in large collections of life insurance figures, the total abstainers seem to present a slight degree of increased longevity over the users of alcohol. Such figures would be more impressive if the methods of writing life insurance and the medical standards of life insurance examinations inspired more confidence. Common observation indicates that there is a danger of occasional and incidental drinking slipping unconsciously into regular and narcotic drinking, particularly in the young. Under stress of untoward circumstances in life it will be easier for such a person to take to alcohol as a narcotic than for a person who has not used alcohol at all, by reason of convictions on the subject. The managements of railways have long ago adopted the view that the only safe drinker is a non-drinker. It is a rule on many railway systems that employees must not only not drink on the days of service—they must not drink at all; the risk of any lapse, even if very rare, is too great. On the other hand, under conditions of occupation making less demands upon the nervous system than driving a locomotive, in the hundred ordinary walks of life, we all know many men and women who partake of alcoholic beverages in an occasional and incidental manner, throughout the normal span of life, without any injury or effect whatever. At best, alcohol is only a luxury. Harmless to

many individuals as they use it, to society as a unit the consumption of alcohol results in profound injury. The question of the harmless use of alcoholic beverages, as one of the pleasant luxuries of life, is a question of ethics and not of physiology. The plea for total abstinence upon the part of all men and women, under all conditions and at all times, must be made upon the basis of the ethical duty and obligation of the individual towards society, and not upon the basis of physiology.

IS THE MONTESSORI METHOD A FAD?

By Frank Pierrepont Graves

Professor of the History of Education and Dean of the School of Education, University of Pennsylvania

After all the popular excitement, spectacular magazine articles and more or less interesting books on the subject, the busy man—even the educator—is still asking, "What is the Montessori Method?" Is it a wonderful discovery of educational principles, an ingenious invention of material and devices or merely a new fad that has been exalted by manufacturers of educational apparatus and enterprising journalists into a profitable cult and propaganda? Will the inventor of the "didactic apparatus" be eventually enshrined a little above Pestalozzi and Froebel, Mann and Barnard, in the educational pantheon, or will she be relegated to the limbo of the exponents of tiddledy-winks and ping-pong, of Belgian hares and Teddy bears? While "neither a prophet nor the son of a prophet," it is in the hope of answering such questions and of satisfying such a mild curiosity, that this sketch is added to the pyramid of Montessorian literature.

In the first place, it should be noted that Montessori is on the right track in seeking a scientific basis for her educational structure. Despite the close resemblance of the "didactic apparatus" to the "gifts of Froebel," it does not find its justification in German idealism. Happily the practice of Montessori, which is so similar to that of the kindergarten, is not handicapped with the necessity of awakening the innate concept of "unity" by "adumbration" in the unsuspecting child through his activities with an ordinary ball. The symbolism, mysticism and obscurantism of the literal Froebelians are replaced by a scientific basis of modern biology, physiology and psychology. Some of Montessori's biological statements have been shown by scientists and physicians to be inadequate, incorrect or out of

date, but, with the rapid expansion of modern science, it is almost inevitable that an educationalist should occasionally reveal a weakness when he builds upon a biological foundation. The scientific attitude of Montessori is an outgrowth of her training and experience. She was the first woman to receive the doctorate in medicine from the University of Rome, and she has followed up this medical education with careful study and researches in psychiatry, experimental psychology, anthropology and pedagogy. And it was her success in supervising the instruction of defective children that led to the experiments that have so stirred the educational world. Her procedure in teaching normal children has fundamentally adhered to the "physiological" method of Seguin, the first great trainer of defectives, and she frankly acknowledges this indebtedness. The scientific foundation of her practice is further shown in the conduct of her schools. Careful records are kept concerning the heredity, parental occupation, feeding and infantile sicknesses of the Montessori pupils, and anthropometric measurements are taken at regular intervals. Moreover, an expert inspection is periodically made of the sanitation and economic conditions in the home of each child.

The Montessori spirit is again revealed in her attitude of allowing the pupil as complete freedom as possible and of holding that the chief function of the teacher should be to study the activities of the child. "The transformation of the school," says she, "must be contemporaneous with the preparation of the teacher. For if we make of the teacher an observer, familiar with the experimental methods, then we must make it possible for her to observe and experiment in the school. The fundamental attitude of scientific pedagogy must be, indeed, the *liberty of the pupil.*" In practice, Montessori carries out this fundamental belief more fully than most Froebelians, who also profess it. Instead of holding the children to a fixed and complete order of exercises imposed by the teacher, she maintains that all education worth having is "autoeducation." The children should select their own occupations and solve

their own difficulties, and should be allowed to develop themselves both mentally and morally. Only when their activities interfere with the general interest or are useless or dangerous, must they be suppressed. However, while in this latitude toward individual expression Montessori carries out the "following, not prescriptive" education of Froebel more logically than that reformer himself, she does not develop participation in group activities to the same extent as he. Nor is the material used as rich and varied. There is little opportunity afforded for the Froebelian construction and invention, and the development of imagination is ruthlessly nipped in the bud. The interesting plays, songs and stories of the kindergarten find little parallel in the Montessori practice, although at present the founder of the system seems to be expanding these elements. The conception of "autoeducation" is admirable, but it is difficult to see how genuine activities are to be carried on, except within a very narrow scope, unless the material of the Montessorian schools be expanded considerably beyond the confines of the "didactic apparatus."

The most discussed features of the Montessori method fall naturally into three groups. It should be noticed that none of these exercises are absolutely original, but they are sufficiently peculiar to demand consideration in any description of Montessorianism. They are connected with (1) activities of practical life, (2) sense training and (3) the formal studies of the elementary curriculum.

1. When the child first enters the school, even while he is beginning to find himself, he may take part in the activities of practical life. Besides practice in ordinary courtesy, cleaning the room, setting the table, serving a meal and washing the dishes, the children learn how to button, lace, hook and clasp various articles of dress by means of a unique apparatus. To the opposite sides of light embroidery frames are attached strips of dress material, linen and leather, which are fastened together at the center. Through constant practice with these materials the child learns to dress himself and trains a variety of useful

muscular co-ordinations. Similar exercises in the activities of ordinary life have for some time been a part of the practice of progressive kindergartens and other modern schools. It may well be that Montessori has suggested several new features in this direction, but we must not suppose that the idea is absolutely novel or that we can follow these devices literally without further consideration. There is always danger that the Montessorians, like the Froebelians, may forget that "the letter killeth, but the spirit maketh alive." His more conservative disciples, in their efforts to preserve all the prescriptions of the master, have often forgotten that Froebel's system was adapted to conditions three-quarters of a century ago in the simple and peculiar environment of a small German village. Let the Montessorians take warning and elaborate their principles in a practice that will be applicable to the complexities and independence characteristic of the twentieth century in the United States.

2. The sense training is the feature most stressed by Montessori herself. Even her remarkable achievements in teaching writing seem to have been forced upon her by the parents of her pupils, who insisted upon the acquisition of something useful by their children. Like Myra Kelley's boy of the Ghetto, they believed the children had not time "to fool with their arms and legs." But with Montessori the sense training is the very essence of her work. She sees in it the biologico-psychological foundation of her system. If this position be maintained, Montessori would logically be regarded as a Simon-pure disciple of Seguin. Her apparatus is strikingly like that used for half a century in American schools for defectives. Even the "three periods" of Seguin find a place throughout her method. For example, she proceeds with the pupil in her training for touch:

(*a*) "Smooth, rough; smooth, rough."
(*b*) "What is this?" "Smooth." "What is this?" "Rough."
(*c*) "Give me the smooth." "Give me the rough."

Moreover, while such sense exercises are doubtlessly of great

value in training defective children, the assumption of their usefulness in the education of normal children seems to be based upon a psychology, which, to say the least, has been rudely shaken. Apparently in this Montessori adheres to the theory of "formal discipline." The exercises are intended to train *general* powers and discriminations. She maintains that "the aim is not that the child shall know colors, forms and the different qualities of objects, but that he refine his senses through an exercise of attention, of comparison, of judgment; the exercises are true intellectual exercises." And this underlying theory is clearly to be perceived in the nature of the apparatus itself. The primal sense of touch is first exercised, as we have implied above, by passing the finger-tips of the children over various materials and pronouncing their nature as "rough" or "smooth;" and then by having the children name and select them by this description. Similarly, other general senses are developed—the "thermic," the "baric," the "stereognostic," the "visual," including color and form, and the "auditory."

3. But, despite her own belief and wish, the feature of the Montessori system that has attracted most attention is its apparent success with the formal studies, especially in the facility and enthusiasm with which the children learn to write and in the beauty of their writing. The inventor of the method, of course, declares that this spectacular performance is of little account, save as a single link in the chain of sense development. All the tactile, dimensional, form and visual training, she holds, leads naturally to the writing co-ordinations. She has, however, made a most careful independent analysis of the writing process into its elements, and has invented three exercises by which the approach to the spontaneous development of the graphic language is directly accomplished. First, the "muscular mechanism to hold and use the instrument in writing" is developed by the child's filling in the outlines of a geometrical form that he has traced upon paper. During this period the child is also engaged in "exercises tending to establish the visual, muscular and auditory image of the alphabetical signs" by means of sand-

paper letters mounted on cardboard. The teacher shows the child how to follow the contour of a letter with his finger as if writing it and at the same time pronounce the sound (not the name) of the letter distinctly. Lastly, he is exercised in the composition of words by selecting unmounted cardboard letters from compartments in a set of boxes resembling a compositor's type-cases. "Now the child, it is true, *has never written*, but he has mastered all the acts necessary to writing." This is the secret of the much-lauded "explosion into writing." The art is learned so unconsciously that the children begin it almost spontaneously and are writing before they realize it. This seems to be one decided achievement of Montessorianism, and if it can be applied to other languages not as phonetic as the Italian, it may be regarded as a permanent contribution to special method.

The Montessori methods in the other formal subjects—reading and arithmetic—are not as striking. Reading is generally acquired after writing through the names of familiar objects written on the blackboard or upon cards. The word is shown the child, and if he interprets the sounds correctly, the teacher has him repeat them more and more rapidly until the word as an entity, and not as a succession of sounds, dawns on his intelligence. After single words can be read with some facility, progress is made to short phrases and sentences. But there is nothing very novel about this method of securing interest in reading, and, when undertaken with English, where sounds are so capriciously spelled, it seems as if it could hardly be effective. Nor do the Montessori methods in arithmetic reveal anything very different in principle from the "table of units" of Pestalozzi, introduced into America nearly a century ago by Warren Colburn, or from the various objective methods in number work that have been so common ever since. The chief feature in the arithmetical methods of Montessori consists in acquiring the fundamental operations by means of rods of different lengths marked off into sections by coloring them alternately red and blue. This apparatus, known as "the long stair," was origin-

ally used for part of the visual training, and seems to have been conveniently at hand when Montessori found it necessary to start number work. After the child has learned to count the sections, the teacher selects a rod at random and asks for the next longer or shorter, or has the child build up all the rods until each result equals the longest. When the numbers from one to ten are fully understood in the concrete, the abstract conception is taught by placing the figures against the corresponding sections. Other exercises are similarly performed until the child has some command of elementary arithmetic.

The value of the Montessori system to modern educational theory and methods should now be fairly obvious. It is at least nominally based upon scientific experiment, and, while its biological statements can not always be accepted without modification, it is permeated with the scientific spirit that is animating modern education. Its emphasis upon individual liberty is most admirable, but the material for exercising this freedom is decidedly limited and social co-operation is somewhat neglected. The exercises in practical activities form a valuable, though not altogether original feature, and the devices for acquiring writing are possibly a contribution. The importance of the sense training for normal children is probably not as great as Montessori supposes, and the psychological theory upon which it is based has been largely discredited. The devices for teaching reading and arithmetic contain no really new principle, and are not markedly superior to the methods practiced for many years by progressive teachers. Clearly, however, while Montessori is neither the tremendous innovator nor "wonderworker" she has been represented to be, her method is not merely the latest fad. Her indebtedness to the past and the comparative worth of her system are fairly evident to one acquainted with the history of education, but it would also seem that she is in harmony with modern progress and has made some contribution to educational practice. Just how large this contribution will be, we can not yet say. Montessori herself is still experimenting both with children of the age with which she began and with

older pupils, and schools on a purely Montessori basis or in combination with Froebelian or other methods are springing up everywhere and are likely to obtain illuminating results. It is possible that a new method may yet arise for the lowest classes in our schools, which will combine the best characteristics of both the Froebelian and the Montessorian pedagogy. At any rate, the existence of either as a system, cult or propaganda should end, and both should be based upon and merged with the wider and more dynamic principles of modern educational practice. The Montessori method can be accounted a fad only when half-baked devotees treat it as something that has leaped full-panoplied from the divine head and prostrate themselves before it in blind worship.

A NATURALIST IN COSTA RICA

By Philip P. Calvert

Professor of Zoölogy, University of Pennsylvania

While great political and commercial interest in Central America has been aroused during the past twenty-five years, due to the possibilities of inter-oceanic canals in Panama, Nicaragua or elsewhere, that part of the world has long had an equally great attraction for the biologist. Thomas Belt spent the period of 1868–72 there and as a result produced his "Naturalist in Nicaragua," of which Darwin wrote: "It appears to me the best of all natural history journals which have ever been published."

Belt lived and worked in comparatively low country north of the suggested route for the Nicaraguan canal. To the south of that route, between it and the present Panama canal, rise the mountains of Costa Rica to an altitude of 12,000 feet. Here, by virtue of the great differences in elevation between sea coast and volcanic peak, the resulting differences in temperature and in rainfall, the proximity to the Equator, and the broken character of the surface of the country, thrive a flora and fauna unexcelled in richness and variety by those of any equal area of the earth's surface.

Costa Rica, one of the six republics of Central America, lies between Nicaragua on the north and Panama on the south, and its shores are bathed by the waters of two oceans. It has an area of 23,000 square miles and thus approaches West Virginia, of all the United States, most nearly in extent. The latest estimates credit it with a population of from 300,000 to 335,000. As contrasted with the other Central American republics, Costa Rica has enjoyed a more peaceable existence, freer from political revolution, while sanitary conditions have been improved to a greater extent.

Into the tracts of virgin forest on the lowlands and on the mountain sides great inroads have already been made to obtain clearings for the cultivation of the banana or of coffee, or for pastures or for lumber itself. The lower lying tropical forests are composed of great trees of many different kinds commingled, while at higher elevations are groves of evergreen oaks. In damp open places, chiefly at lower levels, are the so-called wild plantains with inflorescences of flaming red or of golden yellow. The open pastures on hills of the moister Atlantic slopes, as at Turrialba, are clothed with bright green grasses, while in the valleys are brooks or rivers always noisy from the multitude of rocks and stones in the stream beds against which the swift-flowing current dashes. The trees are covered with parasitic and epiphytic plants of many different kinds, often confusing the eye with the variety of foliage. The candelabra-like cecropia trees are characteristic of tropical America. The railroad from Limon, the Atlantic port, to San José, the capital, follows, in much of its course, the valley of the Reventazón River, whose canyon affords magnificent vistas of tropical verdure.

When the railroad was first projected, the line was intended to pass to the north of the two great volcanos, Turrialba and Irazú, and was actually constructed as far as Carrillo on the northern slope of the latter. Frequent floods and changes in the river courses compelled the abandonment of this plan and the road now ascends the valley of the Reventazón to the south of the two mountains. The northern railway is in operation as far as Guapiles. To the west of Guapiles, the Florida road, passable on horseback or on foot, leads through a virgin forest into which we penetrated for a short distance. There were the tall trees whose trunks rose straight fifty or more feet from the ground before branching, which attract the attention of every traveler in the tropics. The foliage meeting that of other trees shuts out the view of the sky except where a clearing had been made by lightning or wind and then, far above our heads, one could see a crown of red or orange flowers surrounded by brightly

colored butterflies. The trees and shrubs were of numerous kinds and many of them bore a profusion of epiphytes. Here and there through the forest trickled streams of clear water, into which a bright-hued humming bird darted ever and anon. The many unfamiliar plants and insects which met our gaze at every step was so distracting at first that I turned from one thing to another, not able to concentrate my attention on any one. It was my first experience in a truly tropical forest and although we had many opportunities to visit similar scenes later, that day's excursion still seems, as I recall it, like a peep into some mysterious fairyland.

Some ten miles south of Limon is the Banana River region. The country is only a few feet above sea level and quite flat. Some of the Fruit Company's farms here bear the familiar-sounding names of Philadelphia North and Philadelphia South. It was early November and there had been an exceptionally long dry spell. Small brightly colored frogs were quite conspicuous in the banana plantations, one species bright red, another bright blue with irregular black spots.

Peralta, at about 1,100 feet elevation on the railroad to San José, will always be remembered as the place where I saw my first monkey, my first armadillo, my first basilisk, my first toucan and other interesting creatures in the wild state. The forest is still close to the railroad and the Reventazón here, and these animals were probably not more than half a mile away from the trains and locomotives.

On the Atlantic side of Costa Rica Juan Viñas was our most productive locality. Many a favorable place for a naturalist in Costa Rica is discounted by the lack of accommodations, unless, indeed, he is able to bear the considerable expense of transporting tents and provisions to the place where he would be. Juan Viñas is accessible by the railroad; the station lies at one edge of the floor of an old crater. From the level of the track a zig-zag cart road took us through the forest of the canyon side to the turbulent, rock-filled Rio Reventazón, 800 feet below. The village of Juan Viñas and the top of the canyon

are 600 to 700 feet above the railroad, so that we had a vertical range of 1,500 feet for exploration within easy reach.

Among the epiphytic plants, the members of the Bromelia, or pineapple, family are especially interesting on account of the food and shelter which they afford to many kinds of animals, and the inter-relations of these animals. On the moister Atlantic slope of Costa Rica, bromeliads are quite abundant, growing on the branches and trunks of trees in the hedgerows around Cartago, in the cool woods of mountains like Irazú, 11,000 feet above the sea, and in the warm tropical forests of much lower elevation. Sometimes they are situated close to the ground, or they are attached to an unbranched trunk thirty or forty feet from the soil, or may be lodged among the branches at a still greater height. Their leaves, often two or more feet long, taper gradually to near the tip, are toothed or spined on their straight edges, bright green or beautiful pink or red, and spring from a very short stalk so that their bases are pressed closely together. Between the leaf-bases rain water is usually present, and in all localities various forms of animal life take refuge there. Cockroaches, earwigs, katydid-like insects, larvæ of beetles, of moths, of flies and of mosquitos, ants, snails, earthworms, scorpions both true and false, centipedes and even snakes of poisonous repute are common *bromeliadicoli* which we met in our examinations. The length and toughness of the leaves and their sharp spines made it necessary to carry a heavy knife to investigate these plants properly. In October, 1909, we were gladdened by the discovery of undoubted dragon-fly larvæ, in a bromeliad below Juan Viñas, which were carried carefully to Cartago and placed in jars, each containing a little water and a small bromeliad. We fed them with "blood worms," the bright red young of certain flies, readily obtained from a dirty ditch near the town. The first lot of larvæ died out in about two months, but a second lot, from nearly the same locality in December, found our jars sufficiently endurable to complete their growth and to transform into the winged insects in early April. Two of them made this change about 8 o'clock on two bright mornings, and

thus we could photograph them in the act. The exuvia from which the adult emerged and also the larva, when within it, was four-fifths of an inch long, and when the dragon-fly first detached itself it likewise had the same length, but in one and a half hours' expansion, due, some believe, to inspired and also swallowed air, increased the length of its body to three and one-eighth inches and of each wing to two inches. The larva is not longer than those of many other insects, but the adult is conspicuously longer, and this great increase in length is thus a matter of a relatively short time at the period of transformation.

Nothing had been known previously of the early stages of this species (*Mecistogaster modestus*), or of its allies, a group limited to tropical America and remarkable for the length and slenderness of the body and wings of the adults. Mr. O. W. Barrett, however, had suggested, in 1900, that possibly the larvæ lived in the water which is retained between the leaf-bases of bromeliads. This suggestion and the learning from a letter from Mr. F. Knab, of the United States National Museum, that he had recently raised dragon-fly larvæ from such a source in Mexico, were the immediate causes which led us to a careful search among these plants.

These dragon-fly larvæ feed upon mosquito larvæ living in the same water; both sorts of larvæ are cannibalistic and also devour other insects and small crustaceans which, as cotenants or as occasional visitors, come their way. In the drier parts of the Bromelias lives a caterpillar at the expense of the plant itself. *Apterostigma* ants cultivate a fungus which grows on the excrement of the caterpillar and parts of this fungus furnish nourishment to the cultivators. Other, larger and fiercer, *Odontomachus* ants rush to attack the naturalist when he investigates their bromelian home, spreading wide their toothed jaws and snapping them together with a click. Vegetable débris and even earth, perhaps from the feet of birds, gather between the bromelia leaves and earthworms find a congenial abode in the mixture. The bromelia-dwelling beetle *Pachyteles* has imitated the ants in so far as it has developed an antenna-

cleaner on its front legs, consisting of a notch on the tibia lined with hairs through which the antenna may be drawn, and prevented from slipping by a conveniently placed spine on the femur.

The numerous streams of Costa Rica are frequently interrupted by waterfalls of varying height, and these are often spots of the greatest attractiveness to the botanist and the zoologist. The *Thaumatoneura* dragon-flies in all stages of their existence appear to be confined to certain waterfalls, fluttering about in the spray and laying their eggs in the roots and stems of plants which are constantly bathed by water. The larvæ clamber over the rocks of the face of the fall and, attaining their fullness of growth, transform to the winged condition still within reach of the spray.

The adult insect was first made known by Mr. Robert McLachlan, F. R. S., of London, in 1897. His description was made from a single specimen, bearing no label, obtained at a sale, so that Mr. McLachlan was unable to say whence it came, "but as the pin (or rather skewer!) was similar to those used for some other insects in the same collection which were of Chinese or Japanese origin," he hazarded "the conjecture that it may belong to the same region." In 1900, Mr. McLachlan was able to announce that the real habitat of the insect was Chiriqui in Panama. About 1903, Mr. C. F. Underwood collected two species of *Thaumatoneura* at Carrillo, in Costa Rica, and his specimens, coming into the possession of Dr. F. D. Godman, of London, were sent to me and so were included in a volume of the *Biologia Centrali-Americana*. On the first day of our arrival at Juan Viñas, in June, 1909, our entomological friends, Messrs. W. Schaus and J. Barnes, presented me with a couple of *Thaumatoneura* which they had just collected at a small waterfall nearby. Thereafter our visits to Juan Viñas always included one or more examinations of the small streams which fall almost vertically over the steep rock faces of the canyon of the Rio Reventazón. The sides of the canyon are covered almost everywhere with vegetation, including trees of a hundred or

more feet in height, and the descending streams are bordered with a great variety of plants. Close to and within the spray of some of these small waterfalls lives *Thaumatoneura*. It is not an actively moving insect. We have watched the same individual remain motionless for half an hour upon a leaf or twig, even at midday, the spray collecting upon its body and hanging in a drop from the hind end. The eggs are laid apparently within the roots or stems of plants which hang vertically within the waterfall, but we were never able to find them. In June we found a larva which we strongly suspected to be that of *Thaumatoneura*, and, as usual, transported it to Cartago, but it did not live long. All through the following year we sought for *Thaumatoneura* larvæ until, in late April, 1910, we found them transforming at the foot of what we knew as our "high waterfall." This was a nearly vertical fall descending from the top of the canyon, but about one hundred feet above the railroad track (which occupies a narrow ledge cut out of the cliff-face); the water usually disappeared beneath a mass of boulders and flowed underground through loose soil to reappear on the hillside far below the track. After exceptionally heavy rains in the hills above, the stream flowed over the surface almost as far as the track. Up over these boulders we climbed to the foot of the actual fall, where there was a vertical rock wall thickly overgrown with moss and *Commelina*, and on this rock face we found our long-sought larvæ. Two days after our discovery, a landslide occurred—it was after the earthquakes of mid-April—large masses of rock falling and changing all the details of this spot, and leaving the approach so dangerous that we did not dare to climb to our favorite locality again. But we had our *Thaumatoneura* larva previously unknown!

Near the *Thaumatoneura* waterfalls often hangs the "eye of the bull" (*Mucuna*), a vine which derives its popular name from the large round black seeds in its six-inch pods, pods and flowers before them hanging at the end of a separate stalk which may be several feet in length. There are unnumbered caterpillars and beetles of striking form and color. Such is the Harlequin

beetle, two and a half or more inches in length, with a gay coat of dark gray, pale pink and pale green. Its antennæ and front legs are twice as long as its body. It can produce a clicking sound by rubbing two parts of its thorax on each other. Its grub feeds inside rubber trees. One such beetle was itself the home of two species of mites and one of pseudoscorpions, living beneath its wing covers. Another is the Hercules beetle, larger in size, the male with great horns on head and prothorax, which contentedly lived in confinement gnawing at sugar cane. Winged and unwinged walking-sticks abound, the former flashing coral red organs of flight, a pale green wingless one clinging to vegetation like an insect sloth.

Relatives of the *Apterostigma* ants, but more advanced, are the leaf-cutters, familiar to all who have visited tropical America, whose mound-covered nests were first shown by Belt to contain spaces wherein fungus is cultivated by the busy insects on the plant fragments which they laboriously collect. Almost equally well known are the *Pseudomyrma* ants, dwellers in the Bull's horn thorn, obtaining from the plant several kinds of nourishment and severely attacking, by both ends of their anatomy, the unfortunates who come in contact with the thorn.

Cartago was a clean and healthy town of perhaps 10,000 people, with well-paved streets in its central part, an abundance of clear water piped to the houses, an underground drainage system and was lighted with electricity. It was a vacation resort for those employed on the Panama Canal and contained a number of hotels. In one of these we had our headquarters, and to its managers, Mr. and Mrs. Joseph Weldon, we were indebted for many kindnesses and comforts. Situated on the railroad and nearly midway between the Atlantic and the Pacific, Cartago furnished a convenient starting point for excursions in many directions. To the north was the great volcanic mass of Irazú, whose southern slopes are now covered with pastures and cultivated fields, but its northern side is still largely forest-clad. Its great crater, 3,936 feet in diameter according to Dr. Karl Sapper, contains two large daughter craters and nine grand-

daughter craters. One of the last-named discharges steam and sulphurous vapors intermittently. The summit is about twelve miles from Cartago, and the slope is sufficiently gradual to enable one to make the entire journey on horseback. A magnificent panorama is visible from the top when the mountain is free from clouds, but favorable weather conditions are quite uncertain, as our three visits in July, September and March distinctly showed. The biological interests of Irazú proved to be botanical rather than zoological.

Most of the volcanoes of Costa Rica are round-topped, not to say flat-topped, and their slopes usually gradual. Some have been inactive for many years (like Irazú, 1723); others, although in eruption more recently (Turrialba, 1866), display their power at long intervals, while Poás every few years sends forth a column of steam, water or ashes. The craters of Irazú are in part clothed with vegetation quite unsuggestive of their actual character. Poás possesses a deep-laid crater lake and is looked on as an elevated geyser. One of its outbursts occurred while Mrs. Calvert was with our good friends, Mr. and Mrs. J. B. Clark, near Alajuela, whose house we had come to regard as our second home in Costa Rica. They lived some ten miles from the volcano, and in January, 1910, she witnessed a picturesque eruption of ashes. Accompanying her hosts to the crater on the following day, for the eruption lasted but half an hour, they found all the vegetation ash-covered as if with snow and all the birds and insects flown from the mountain slopes.

San José, the capital of Costa Rica, lies on the Pacific side of the country, thirteen miles west of Cartago, at an altitude of 3,800 feet. Professor J. Fidel Tristán, Director of the College for Young Ladies here, was our untiring friend, aiding us with advice and information, accompanying us on many an excursion, procuring maps, guides, shelter and friends for us, which made our stay in the country far more productive than it otherwise would have been. A naturalist himself, he did all in his power to further our researches. Professor Anastasio Alfaro, Director, and M. Ad. Tonduz, botanist, at the Museo Nacional, respec-

tively, were most kind in indentifying animals and plants for us, and another good friend was the ornithologist, Señor Don Jose Zeladón.

It was doubtless due to Professor Tristán that, with the approval of the then President of the Republic, Señor Don Cleto Gonsalez Viquez, and his Minister of Education, Señor Don Ricardo Fernandez Guardia, I was permitted to accompany a Commission for examining the qualifications of teachers of the public schools to the Province of Guanacaste in January. The members of the Commission, Professors Obregón, Perez Martin, Orozco and Tristán and Señor Villar, were most agreeable and courteous companions and the month spent with them was highly interesting and instructive.

Guanacaste is the northwestern of the Provinces of Costa Rica and borders the Pacific and Nicaragua. It has been visited by but few naturalists. From San José we went by train forty-one miles to Orotina, thence by horse and mule fifteen miles to Esparta—a gap in the transcontinental railway here existed at that time (January, 1910)—thence by rail again to Puntarenas on the Gulf of Nicoya, an arm of the Pacific. A small steamboat took us northwestwardly to the head of the Gulf and up the Rio Tempisque to Puerto Ballena. Here we mounted horses and reached another Filadelfia where we spent the night. A hot ride for six hours through a mostly open country brought us to Liberia, the capital of the province, on the following day. While the Commission held examinations, I was busied in collecting insects, finding here, as everywhere in Costa Rica, many hitherto unknown for this country. An interesting side trip with Professor Tristán was to the foot of the almost eternally cloud-veiled volcano Rincon de la Vieja and its solfataras. From Liberia we went to Santa Cruz in the upper part of the Peninsula of Nicoya, thence to Bolsón, and back to Puntarenas by the steamer. Monkeys, especially the deep-voiced howlers, whose calls, when I first heard them, I took for the bellowings of bulls, and parrots, including brightly colored macaws, are common in Guanacaste, and it was a frequent occurrence to

meet them as we passed through the forests or even more open roads. It is said that the abundance of monkeys here is largely due to their not being used as food for man to the same extent as on the Atlantic side.

The late Professor Paul Biolley, a native of Switzerland, who died in San José in 1908, was an active naturalist in Costa Rica for twenty-three years. To him many a student in Europe and the United States was indebted for material for study, and I, too, am glad to acknowledge my obligations to him. Vacation from school in Costa Rica is in December, January and February, and in these months Professor Biolley frequently visited the lower portions of the Pacific slope. For the sake of being able to compare data from another time of the year with his results, we made a visit to one of his collecting grounds, Surubres, in October, a possibility due to Professor Tristán and to Señor Don Pedro Bonnefil and his sister Señorita Bonnefil. Their charmingly situated hacienda, with a large higueron (Ficus tree) before the door, shedding its leaves at this time as new leaf buds were opening; with the little Rio Surubres near by, reached by a steep path down through a patch of forest, where our feet sank into a thick carpet of maiden-hair ferns, selaginellas and wild begonias with delicate pink blossoms; and, far off toward the sunset, the gulf and the peninsula of Nicoya, and beyond the latter the shining Pacific are memories which are rendered still brighter by the recollection of the hospitality which we enjoyed.

* * * * * * * *

Eleven and a half months had passed in our paradise and our appreciation of its charms was increasing daily. Yet we never valued it so highly, of course, as we did after we were driven out of it.

The 13th of April, 1910, came. I was near Turrúcares; Mrs. Calvert at Cartago, thirty-five miles apart. At about half-past twelve in the morning began a series of earthquakes of varying intensity and interval. Although I was awakened by them, they did not seem sufficiently severe to induce me to

leave my bed in the second story of a frame house, but at San José and Cartago they were stronger and everyone fled to the streets, where Mrs. Calvert and others from Weldon's Hotel passed the night. Walls were cracked, plaster fell, the universal tile roofs were disarranged or thrown off and poorly-built adobe houses were demolished. It was a nerve-racking experience, and it is now difficult, for those of us who passed through the sequel three weeks later, to understand how we continued to live there in the intervening time.

Earth tremors continued, not a day passing without them, but as they were generally of decreasing intensity, we hoped that the worst was over. About 185 were recorded by the seismograph at San José between April 13th and May 3d. We went to Juan Viñas again, with most successful results for our investigations. Mrs. Calvert returned to Cartago on April 30th, I on May 4th, reaching there about 5.30 P. M. We had dinner as usual and, having gone back to our room, had seated ourselves to look over the mail that had arrived during our absence. While so engaged, at 6.50 P. M., without the slightest preliminary sound or tremor, came a most terrific earthquake. The electric lights within and without were instantly extinguished, owing to the derangement of the dynamos. As we tried to escape we were thrown to the floor, which seemed to rise and fall under us. There was a roar of falling walls and the air was filled with the dust of plaster. We could do nothing but lie where we had fallen until the shaking ceased. Then we rose and, climbing over the piles of débris, made our way to the window opening on the street and so escaped. Three walls and the ceiling of our room were still in place, a fourth, of brick, fell, but, fortunately, not on us. We remained in the street all night, the ground quivering incessantly with now and then a sharp shock, but less severe than the first. We realized that the town was utterly destroyed, but not until morning broke could we see how much, and how little, was left that we could recognize. The number of lives lost in Cartago and the surrounding villages was 272.

The full story of such an event is too long for this place. We lost the shelf-full of larvæ that we were rearing, but, wonderful to relate, little else, although some of our trunks were buried out of sight under fallen bricks and mortar. We spent May 5th in rescuing all that we could from the ruins and slept in the street that night. The railroad to Limon having been reopened on the 6th, we took the first train to the coast that day. It was hard to lose the three more months that we had expected to stay in Costa Rica; it was sadder to see the fearful ruin of a country we had come to love so well. Although Cartago and its environs had suffered most, the whole central portion of Costa Rica had been shaken severely, and for weeks afterward the inhabitants were afraid to return to their houses, and spent most of the time in open places, under tents and all sorts of makeshift shelters. Under such circumstances, with the approach of the rainy season, the fear of further earthquakes and of pestilence resulting from the decay of bodies buried in the ruins, it seemed best that we should depart, and we sailed from Limon on May 9th for New York.

THE ENGLISH BIBLE AS LITERATURE

By Josiah H. Penniman

Professor of English Literature and Vice-Provost of the University of Pennsylvania

The Bible is the world's Greatest Book. It has the widest circulation. It is stated that 28,000,000 copies of the Bible were sold in 1912–13, about half that number being in the English language.

There must be some reason for this, apart from the zeal of those who desire to propagate a religious faith. That very zeal must arise from the qualities which the book possesses to portray, and interpret man to himself, and to set forth the highest and noblest thoughts of man about his ultimate destiny. It is only great thoughts that can rise to find expression in great literature, and the Bible is the greatest literature.

When James VI of Scotland, the son of Mary Queen of Scots, became, on the death of Queen Elizabeth in 1603, James I of England, there were in existence and in use in addition to partial translation of the Bible in Anglo-Saxon:

John Wycliffe's translation, circulated in manuscript only, about 1360 to 1384.

William Tindale's New Testament, 1525.

William Tindale's Pentateuch, 1530.

Miles Coverdale's Bible, 1535, the first complete printed English Bible.

Matthew's (John Rogers) Bible, 1537.

The Great Bible, 1539.

Taverner's Bible, 1539.

Whittingham's New Testament, 1557.

The Genevan Bible, 1560.

The Bishops' Bible, 1568.

The Rheims, or Douay, New Testament, 1582; the Old Testament, 1609–10.

To these have been added:

The "Authorized Version" (King James), 1611.

The Revised Version of the New Testament, 1881; complete Bible, 1885.

American Standard Revised Version, 1901.

Besides various translations and arrangements by individuals, such as the Twentieth Century New Testament, The American Bible, The Modern Reader's Bible, etc.

The greatest event of the reign of King James and the one with which his name is most familiarly connected was the publishing of a book about which the title page gives us the following information:

"The Holy Bible, containing the Old and New Testaments translated out of the original tongues; and with the former translations diligently compared and revised, by his Majesty's Special Command."

In the address of the translators to the King occur these words:

"For when your Highness had once out of deep judgment apprehended how convenient it was, that out of the original Sacred Tongues, together with comparing of the labours both in our own and other foreign languages, of many worthy men who went before us, there should be one more exact Translation of the Holy Scriptures into the English Tongue; Your Majesty did never desist to urge and to excite those to whom it was commended, that the work might be hastened, and that the business might be expedited in so decent a manner, as a matter of such importance might justly require."

Two years ago, in 1911, we celebrated by special meetings the tercentenary of the completion of the King James Bible, commonly known as the Authorized Version.

It is perhaps not generally known that the Bible, now termed the Authorized Version, was modeled on the Bishop's Bible, that it has never been especially sanctioned, and that its "authorization" is derived solely by inheritance from the Bishop's Bible. Parker's direction to the revisers was, "To follow the common translation used in the Churches not to

recede from it, but where it varieth manifestly from the Hebrew or Greek original," One of the cases in which they hesitated, was over the reading, "Is there not treacle at Gilead?" from which this version gets the light nickname "Treacle Bible." Hence, this is one of the instances in which an alteration was made, the revisers giving preference to the word "balm" with "rosin" as a marginal alternative.

There are, of course, other editions with nicknames such as the "Breeches" Bible, the Vinegar Bible, etc. It took from 1604 to 1611 for the learned scholars to whom the task was entrusted to complete it.

A recent edition of the King James Bible in the Series of Tudor Translations, London, 1903, edited by W. E. Henley, has these interesting statements concerning the original issues:

"There were two issues of the great English Bible, both dated 1611. Both are black letter folios. Each page of both issues begins and ends with the same word, yet in each page there are variations in text amounting in the aggregate to many thousand instances. These two issues are generally distinguished as the *Great He Bible* and the *Great She Bible*, on account of a variation in the last line of Ruth 3:15, which in one issue is printed, 'he went into the city,' and in the other 'she went into the city.' There has been much discussion as to which of these issues is the veritable *editio princeps* of the Authorized Version of the English Bible. The balance of critical opinion, however, is in favour of the 'He Bible,' and the present edition is reprinted from that text, with the assistance of the Oxford reprint of 1833."

The Douay Bible, as it is commonly called, the English Version used by the Roman Catholic Church, bore the following on the title-page of the first edition:

"The Holy Bible Faithfully Translated Into English, out of the Authentical Latin; diligently conferred with the Hebrew, Greeke, and other Editions in divers languages; with Arguments of the Bookes, and Chapters, Annotations, Tables, and other helps for better understanding of the text, for the dis-

coverie of Corruptions in some late translations, and for clearing Controversies in Religion; by The English College of Douay. Printed at Douay, by Lawrence Hellam, at the Signe of the Holie Lambe, 1609." Earlier was "The New Testament of Jesus Christ Translated Faithfully Into English, out of the authentical Latin, according to the best corrected copies of the same; diligently conferred with the Greeke and other Editions in divers languages; with Arguments of Bookes and Chapters, Annotations, and other necessarie helpes for the better understanding of the text, and specially for the discoverie of the Corruption of divers late translations, and for clearing the Controversies in Religion of these daies; In The English College of Rhemes. Printed at Rhemes, by John Fogny, 1582."

Foreign translations which were accessible to the English translators in 1604 were the Septuagint, or Greek Version of the Old Testament, made in Alexandria in the third century B. C.; The Vulgate, or Latin Version of the Old and New Testaments, made in the fourth century A. D., by Jerome on the basis of an old Latin Version.

The final complete edition of the German Bible, known as Luther's translation, was issued in 1545. There were French versions accessible, the first complete French Bible being a translation of the Vulgate in 1487; Italian Versions of 1471 and 1530–32 and 1562; Spanish Versions of 1487 and 1569; a Danish Version of 1550; a Swedish Version of 1541. This list is not complete and no mention has been made of several ancient versions. It is sufficient, however, to show how much attention had been given to translating the Bible into the languages of Western Europe.

Before leaving this part of my subject, I must mention a fact which may be new to many of you. The oldest known manuscript of any part of the New Testament in its original Greek now reposes in a case in the University of Pennsylvania Museum. It is a fragment of papyrus of the third century discovered at Oxyrhyncus in 1896–97. It contains verses of

the first chapter of Matthew's gospel and its text was published with other Oxyrhyncus Papyri.

We are not concerned with these versions in the present connection except to mention them as existing with others when the translators of 1604 began their task. The familiarity of the people with the language of the Bible made it a serious thing to change a word of it without good reason, so that the King James translators announced not only that they had translated directly from the Hebrew of the Old Testament and the Greek of the New, which was not true of previous English translators, but that their work had been a diligent comparison and revision of previous translations. The variants among these English translations were reasons for a new version which should be authoritative. But when the new translation appeared people felt about it just as we felt about the Revised Version of 1881–85 and the American Revised Version of 1901. Through the reading in the Church Services and in the home, the language of the Bible was familiar to the people, no part more so than the Psalms, which, for this reason, you will still find in an older translation in the Psalter in the Book of Common Prayer, though the lessons and other passages of Scripture are read from the King James Version. In many passages the language of the Psalter is more beautiful, even if less accurate, than that of the Authorized Version. It has been suggested that Falstaff, who on his deathbed is reported by Dame Quickly (Henry V, 2, 3) to have "babbled of green fields," was trying to recite the 23d Psalm in an old version.

As the English Bible has been a growth, it will be interesting to see the spirit in which the scholars, with Wiclif at their head, approached the task of making the first English Bible. In the Prologue to the second recension attributed to John Purvey, c. 1385–90, we read, after a discussion of how certain Latin forms and constructions were to be rendered:

"At the beginning I purposed with God's help to make the sentence as true and open in English as it is in Latin, either more true and more open than it is in Latin."

The proper translation from foreign languages into English remained from Wiclif's time down to the time of Dryden and Pope and later, a subject of serious discussion among critics. Ben Jonson's chief boast was in regard to his translations. The translators of the Bible were careful to produce a work which by its literary qualities should rank high in English. They succeeded beyond their fondest hopes, but not beyond their aspirations.

Of the Revised Version, I will take time to say only a few things:

1. It has corrected many imperfect or wrong renderings of previous translations. One striking example will illustrate this. In the King James Bible, I Timothy, 6:9–10 verses reads:

"But they that will be rich fall into temptation and a snare, and into many foolish and hurtful lusts, which drown men in destruction and perdition. For the love of money is the root of all evil."

The English Revised Version reads:

"But they that desire to be rich fall into a temptation and a snare and many foolish and hurtful lusts, such as drown men in destruction and perdition. For the love of money is a root of all kinds of evil."

The American Revised Version modifies this only by reading "they that are minded to be rich" for "they that desire to be rich."

There are, of course, many other examples of differences between the various versions, the modernization of some expressions having been thought desirable, even though the older translation was accurate.

2. A second important fact concerning the Revised Versions is that the translators have been mindful of the literary and logical unity of passages which in earlier translations have been divided wrongly by chapter and verse divisions. These divisions have really interfered seriously with the intelligent reading of the Bible. They are no part of the Bible and are properly relegated to the margins, for reference only, in the

Revised Versions. In the manuscripts not even the words are divided. Punctuation is all modern. Notice the necessity for parenthesis as in the Gospel of St. John 1:14; Deut. 2 and 3.

Examples of undesirable chapter divisions are to be found in the book of Jonah, and in the twelfth chapter of The Epistle to the Hebrews, which begins with the word "Wherefore" A. V. or "Therefore" R. V., indicating that it is the conclusion of the argument of the preceding chapter. The indication of the five separate collections of poetry in the Book of Psalms is to be noted in the Revised Versions and the completeness of each book is shown by the doxology at the end of it. The Epistle to the Hebrews is a good example also of the great gain to the student of literature which comes from the printing of poetry as poetry and not in the same manner as prose. This is done throughout the Revised Versions and reveals at once the characteristic form of Hebrew poetry which is parallelism of structure and of thought. This parallelism appears in many varieties, all quite simple when once the general principle is known. Bishop Lowth, in his lectures on Hebrew poetry in the middle of the eighteenth century, was probably the first Englishman to understand this. This characteristic makes it possible to represent in an English translation the most important peculiarities of Hebrew poetry, so far as concerns form. Although there is rhythm of some kind in the Hebrew and an occasional rhyme occurs, possibly for emphasis, meter and rhyme, which we associate with the idea of form in poetry, do not exist in Hebrew as in English, although there are several somewhat irregular rhythms which scholars think they have detected. In Hebrew, as in English, poetry is distinguished from prose by elevation of thought and by the use of lofty, often figurative language.

The recognition of the logical or literary unit, as distinguished from the mechanical unit of chapter and verse, is to be observed in the translation of the twenty-eighth chapter of Job, where the whole idea is presented under the figure of a miner working beneath the ground and even overturning

"mountains by the roots" in his search for "every precious thing." The path which "no bird of prey knoweth" and "the proud beasts have not trodden" is that of the miner in his mine. There is a reference to his draining of his mine, and binding "the streams that they trickle not." Instead of a series of vague utterances concerning God, this chapter is one of the most logical and beautiful in its consistent adherence to the single figure. Compare also the careful arrangement of Psalm 19, and also the division of Psalm 42, which, with Psalm 43, constitute one poem wrongly divided in our Authorized Version.

Of course, it is perfectly obvious that in order to study the Bible as literature we must, if we would study it exhaustively, deal with it in the original languages, but, and this is a very wonderful thing about it, the English Bible is a translation, which by the very perfection of its English occupies the position of pre-eminence among English books.

Wyclif, Tyndale, Coverdale, these were the men who were chiefly responsible for the English of the Bible. Revisers have made alterations and corrections, but in the main the Bible is as Coverdale left it, the New Testament and Pentateuch being chiefly Tyndale's.

From Tyndale's New Testament, 1525, to the King James Version, 1611, is a period of eighty-six years. It was a period which saw writings of Shakespeare, Jonson, Marlowe, Spenser, Sidney, Bacon, Lyly, Greene, Peele, Hakluyt, Harvey, Dekker, Nash, Lodge, Drayton, Chettle, Constable, Daniel, Hooker, Chapman, Raleigh, Campion, Carew, Breton, Middleton, Camden, Ascham, Mulcaster, Hall, Donne—why swell the list? And yet the translators of the Bible performed their difficult task and produced a book, the English of which is not exceeded by any of those masters, for its dignity, purity, clearness and sheer beauty. Of the 6,000 different words used by the translators a very few only are obsolete after three centuries. The Saxon foundation of our modern English is to be found in the English Bible. In the parable of the sower in Matthew 13

only three words out of 106 used are not Anglo-Saxon, only six of sixty-five in the Lord's Prayer are of Latin origin. In Hamlet's Soliloquy thirteen out of eighty-one words are not Saxon. The Saxon quality of the language is a marked characteristic of the Bible.

Have we yet the final English translation? We can hardly improve on its language, but increasing knowledge, derived from investigations, excavations and discoveries indicate that much may yet be learned of the full meaning of what is contained in the Bible. Those of you who had the pleasure of hearing the lectures of Sir William Mitchell Ramsey, in this hall, will remember how much light is thrown, by his recent excavations in Asia Minor, on expressions used by St. Paul when he wrote to people whose religious ideas were expressed in terms of the ancient mysteries, like those at Antioch in Pisidia.

At this point I wish to read to you a passage from "A Short History of the English People," by J. R. Green:

"The popularity of the Bible was owing to other causes besides that of religion. The whole prose literature of England, save the forgotten tracts of Wyclif, has grown up since the translation of the Scriptures by Tyndale and Coverdale. No history, no romance, no poetry, save the little-known verse of Chaucer, existed for any practical purpose in the English tongue when the Bible was ordered to be set up in churches. Sunday after Sunday, day after day, the crowds that gathered around Bonner's Bibles in the nave of St. Paul's, or the family group that hung on the words of the Geneva Bible in the devotional exercises at home, were leavened with a new literature. Legends and annals, war songs and Psalms, State-rolls and biographies, the mighty voices of prophets, the parables of Evangelists, stories of mission journeys, of perils by the sea and among the heathen, philosophic arguments, apocalyptic visions, all were flung broadcast over minds unoccupied for the most part by any rival learning. . . . No version could transfer to another tongue the peculiar charm of language

which gave their value to the authors of Greece and Rome. Classical letters, therefore, remained in the possession of the learned—that is, of the few . . . their direct influence was purely intellectual. But the tongue of the Hebrew, the idom of the Hellenic Greek, lent themselves with a curious felicity to the purposes of translation. As a mere monument, the Engligh version of the Bible remains the noblest example of the English tongue. . . . The power of the book over the mass of Englishmen showed itself in a thousand superficial ways, and in none more conspicuously than in the influence it exerted on ordinary speech. It formed, we must repeat, the whole literature which was practically accessible to ordinary Englishmen; and when we recall the number of common phrases which we owe to great authors, the bits of Shakespeare, or Milton, or Dickens, or Thackeray, which unconsciously interweave themselves in our ordinary talk, we shall better under stand the strange mosaic of Biblical words and phrases which colored English talk two hundred years ago. The mass of picturesque allusion and illustration which we borrow from a thousand books, our fathers were forced to borrow from one; and the borrowing was the easier and the more natural that the range of the Hebrew literature fitted it for the expression of every phase of feeling. When Spenser poured forth his warmest love notes in the "Epithalamion," he adopted the very words of the Psalmist, as he bade the gates open for the entrance of his bride. When Cromwell saw the mists break over the hills of Dunbar, he hailed the sunburst with the cry of David: "Let God arise, and let his enemies be scattered. Like as the sun riseth, so shalt thou drive them away!"

And to a Philadelphia audience I may surely add that when a suitable inscription was desired for the old bell in Independence Hall, it was found in Leviticus 25:10, "Proclaim liberty throughout all the land unto all the inhabitants thereof."

The Bible came from the Jews, who produced a great deal of literature at different periods, much of it in other languages than their own. The Old Testament and Apocrypha contain

almost all that is left to us of the literature of the Jews in their ancient language, for Hebrew was not spoken in the time of Christ, Aramaic being the language of Palestine then. There are passages in Aramaic found in Ezra 4:8, 6:18, 7:12–26 and in Daniel 11:4 to end of Chapter 7.

The Hebrew Bible consists of three separate collections of writings, the first, and to the Jew the most important, being the Torah or Books of Moses; the second, the Nabiim or Prophets; and the third, the Kethubim or sacred writings, of which the last collection contained the poetical books, Psalms. Proverbs, Job, Canticles and Lamentations, and also Esther and the later prophets, and the historical books of Daniel, Chronicles, Ezra and Nehemiah. It is to these separate collections that reference is made a number of times in the later Greek writings of the New Testament, a notable one to the entire three being the words of Jesus, found in Luke, 24–44. "things which are written in the law of Moses, and the Prophets and the Psalms." Another notable reference to the Ancient Sacred Scriptures occurs in Luke 16:29, where Abraham is represented as saying to the rich man (Dives being the name from the Vulgate), "They have Moses and the Prophets." There are many similar passages. "The Law and the Prophets" is probably the most familiar phrase of this kind.

That the literature contained in the Old Testament is only a part of what was once a large, widely diversified and highly developed literature is shown by the allusions to many works that no longer exist, such as The Book of the Wars of the Lord, mentioned in Numbers 21–14, the Book of Jasher, mentioned in Joshua 10–13 as containing the lines uttered by Joshua commanding the Sun to stand still, and in II Samuel, 1–18, as the repository of David's beautiful lament over Saul and Jonathan; the Chronicles of the Prophet Nathan, II Chronicles, 9–29; the Books Ahijah, Shemaiah and Iddo, II Chronicles, 9–29, 12–15, 13–22; the Acts of Solomon, I Kings, 11, 41; the Book of Jehu, II Chronicles, 20–34, and others.

Of the use of books in the writing of other books we have examples in II Kings, 18–20, and Isaiah, 36–38, Chapter 19 of II Kings being identical with Chapter 37 of Isaiah, and also in the duplications and repetitions in our five books of Psalms, and in other books. That there were libraries in ancient times is an established fact, and from Egypt and Babylonia have come specimens of literature of a high order and great antiquity. The accounts of the Creation and the Deluge which we have in the Bible had ancient Babylonian versions.

The quality of the literature in thought and form indicates that we have only specimens, in some instances, of what was a numerous class of literature, such as the short stories of Ruth and Esther and Jonah, and in the non-canonical books, the stories of Susannah, Judith and Tobit. The Wisdom literature of Proverbs and Ecclesiastes finds non-canonical examples in the Wisdom of Solomon and Ecclesiasticus. The Apocalypse, or Vision book, of the New Testament has Old Testament examples in Daniel and Ezekiel and in the second book of Esdras in the Apocrypha.

The Idyl, or short story, finds a wonderful example in the Book of Ruth with its picture of the life of the village community and the intense interest of the women in the homecoming of Ruth. The Love or Marriage Song finds an example in the Song of Solomon, or the series of Songs; the marriage hymn, in Psalm 45, a Prothalamium; the drama, strictly speaking, does not exist, but in Job we have a great philosophical poem in dramtic form and in several of the Psalms we have dialogue, or the voices of several speakers as in Psalms 2, 24, 32, 91.

Parabolic language is common to the Old Testament and to the New, but it may be interesting to note here the difference between the parable such as we are familiar with in the Bible and the fable with which we are most familiar in Aesop. The parable never transcends the order of nature—we have no talking animals or inanimate objects as in Aesop. Passing over the story of Balaam's Ass, told in Numbers, which was a

miracle, and not therefore a fable, I would mention that there are two genuine fables in the Bible, both in the Old Testament and both concerning trees. They are the fable of Jotham, told in Judges 9:8–15, and the fable of Jehoash, told in II Kings, 14:9.

For dramatic situations picture to yourselves the scene where Moses, having come down from the mountain, finds the people worshipping the golden calf, Exodus 32; or the scene where Nathan, having told the parable of the Ewe lamb, points his finger at the King and says, as with the voice of God, "Thou art the man," II Samuel, 12; or the situation, when in the King's banquet hall, Queen Esther reveals the fact that she is a Jewess, and Ahasuerus, in his wrath at her story of wrong, asks, "Who is he? and where is he" and Esther names Haman. Read Esther 5, 6 and 7 for skilful arrangement of a plot of which Ahasuerus and Haman have no idea until Haman is accused at the banquet.

For dramatic situations in the New Testament turn to the account of the Transfiguration, the Agony in Gethsemane, the betrayal by Judas, the scenes before Pilate and the High Priest, the Denial by Peter, the appearances of Christ after the Resurrection, the Story of Pentecost, the punishment of Ananias and Sapphira, the Conversion of Saul, the Speech on Mars Hill—all thrilling with emotion, with the action and reaction of personalities.

For orderly arrangement in the presentation of ideas, notice the preparation that is made in Job 36 for the introduction of Jehovah in 38. The scene is out of doors. Elihu is speaking, a storm is gathering. Elihu notices the clouds and calls attention to them (35:5); he feels a drop of rain, to which he refers (36:27). The lightning and thunder begin and grow louder (36 and 37), and at the beginning of Chapter 38 "The Lord answered Job out of the whirlwind." Lightning and thunder accompany and indicate the near presence of God. This is led up to with consummate artistic skill.

For poetry of nature (Chaucer calls "Nature, the Vicar of

the Almightie Lord"), read Psalms 19, 23, 29 and 104, and may I refer you here to a passage in the writings of John Dennis, the early eighteenth century critic, who, in his "Advancement and Reformation of Modern Poetry," 1701, compares a passage in the first Georgic of Virgil with the treatment of a storm by the Psalmist in the 18th Psalm, which illustrates also what I have been saying about the book of Job. Dennis quotes from Dryden's Virgil:

> The lofty skies at once come pow'ring down,
> The promis'd Crop and Golden labours drown,
> The Dykes are fill'd, and with a roaring sound,
> The rising Rivers float the nether ground,
> And rocks the bellowing voice of Boiling Seas rebound,
> The father of the Gods his glory shrowds,
> Involv'd in Tempest's and a night of Clouds.
> And from the middle darkness flashing out,
> By fits he deals his fiery Bolts about,
> Earth feels the motions of her angry God,
> Her Entrails tremble, and her Mountains nod,
> And flying beasts in Forests seek abode.
> Deep Horrour seizes every Human Breast,
> Their pride is humbled, and their fear confest.

"But now let us see how the Psalmist has treated the same subject in the 18th Psalm, and we shall find that the greatness of Virgil is littleness compared to his."

6. In my distress I called upon the Lord, and cried unto my God: He heard my voice out of his Temple, and my cry came before him, even into his Ears.

7. Then the Earth shook and trembled, the foundations also of the Hills moved and were shaken, because he was wroth.

8. There went up a smoke out of his Nostrils, and fire out of his Mouth devoured, Coals were kindled by it.

9. He bowed the Heavens also and came down, and darkness was under his Feet.

10. And he rode upon a Cherub, and did fly; Yea he did fly upon the Wings of the Winds.

11. He made darkness his secret place; His pavilion round about him were dark waters, and thick clouds of the skies.

12. At the brightness that was before him his thick clouds passed, hailstones and coals of fire.

13. The Lord also thundered in the Heavens, and the highest gave his voice, Hailstones and Coals of Fire.

14. Yea, he sent out his arrows and scattered them, and he shot out lightnings, and discomfited them.

15. Then the channels of waters were seen, and the foundations of the world were discovered, at thy Rebuke, O Lord, at the blast of the breath of thy nostrils.

(I have read from the King James Version.)

"Now, in the first place, Reason finds its account better here than it does in Virgil; for the more amazing effects that we see of Divine displeasure, the more it answers our Idea of infinite wrath. But there is nothing that Virgil has said upon this subject, but what is much stronger in the Psalmist; and there are several things in the latter, which are by no means in Virgil."

What is the source of power in Hebrew Poetry? Of course the loftiness and beauty of its thought. But as we read it, even in translation, we observe that it has other qualities which give it power. Renan, in his "History of Semitic Languages," has mentioned, as one of the most notable things about the Hebrew language, the use of concrete, physical terms for the expression of abstract ideas or emotions. Pride, for example, is represented by a high head and a stiff neck. Anger is represented by rapid breathing, heat, a noisy breaking of things. The Hebrew has no word for Self, the word for bone being used to convey the idea, to think is to speak. Forgiveness is the removing of the offense far away, a putting it behind the back. The author of Job represents God as putting sin into a bag and then throwing it behind Him. Many other examples will suggest themselves to you, such as the passage in Job in which Eliphaz describes his vision of the night (Job 4, 14–15):

Fear came upon me, and trembling,
Which made all my bones to shake.
Then a spirit passed before my face;
The hair of my flesh stood up.

Time will permit me to read only a few passages to illustrate the qualities of the Bible as literature. Notice the picturesque quality, the intensely human feeling, and the wonderful artistry of the lines in the Song of Deborah, in which reference is made to the mother of Sisera, who, like every mother, looks proudly for the home-coming of her warrior son. But he is at that moment lying slain. The poet sees the mother with her ladies looking through the lattice. The mother sees, in her vision, the victorious general, dividing the spoils (see Judges 5, 28–30):

Through the window, she looked forth, and cried,
The mother of Sisera cried through the lattice,
Why is his chariot so long in coming?
Why tarry the wheels of his chariots?
Her wise ladies answered her,
Yea, she returned answer to herself,
Have they not found, have they not divided the spoil?
A damsel, two damsels to every man;
To Sisera a spoil of divers colours,
A spoil of divers colours of embroidery,
Of divers colours of embroidery on both sides, on the necks of the spoil?

There are in the Bible other wonderful passages about a mother's love for her son. The intensely human qualities of the Bible are among its great charms.

Of the importance of the knowledge of literary form as an aid to interpretation of the meaning, I shall, in closing, speak of only two examples, one in the Old Testament and one in the New. The literary form of the first chapter of Genesis is no accident. It shows deep thinking expressed clearly in a form evidently adopted for the purpose of emphasizing unity, regularity and order. This was pointed out in a remarkable article by W. G. Elmslie in the *Contemporary Review*, Volume 52:

"Looking at our analysis of their contents, we perceive that the six days fall into two parallel sets of three, whose members finely correspond. The first set presents us with three vast tenements or habitations, and the second set furnishes these with occupants. The first day gives us the sphere of light;

the fourth day tenants it with sun, moon and stars. The second day presents the realm of air and water; the fifth day supplies the inhabitants—birds and fishes. The third day produces the habitable dry land; and the sixth day stocks it with the animals and man. The idea of this arrangement is, on the face of it, literary and logical. It is chosen for its comprehensive, all-inclusive completeness. To declare of every part and atom of Nature that it is the making of God, the author passes in procession the great elements or spheres which the human mind everywhere conceives as making up our world, and pronounces them one by one God's creation. Then he makes an inventory of their entire furniture and contents, and asserts that all these likewise are the work of God. For his purpose—which is to declare the universal creatorship and the uniform creaturehood of all Nature—the order and classification are unsurpassed and unsurpassable. With a masterly survey that makes everything and omits nothing, he sweeps the whole category of created existence, collects the scattered leaves into six congruous groups, enclosed each in a compact and uniform binding, and then on the back of the numbered and ordered volumes stamps the great title and declaration that they are one and all, in every jot, and title, and shred, and fragment, the works of their Almighty Author, and of none besides."

It will be observed that on the third and sixth days there are two creative acts each, the second of which marks a climax, that on the third day being the climax of inanimate creation, vegetation, that on the sixth day, the climax of all creation, man.

This may be arranged as a diagram as follows:

CHAOS

THE SPIRIT OF GOD

And God said	And God said
Light created	Lights (sun, moon, stars) created
And God saw that it was good	And God saw that it was good
Evening and morning one day	Evening and morning a fourth day

And God said
Heaven Firmament of division
created Waters
And God saw that it was good
Evening and morning a second day

And God said
Dry land created
And God said
Vegetation created
And God saw that it was good
Evening and morning a third day

And God said
Fowl of the air and fish of the
sea created
And God saw that it was good
Evening and morning a fifth day

And God said
Land animals created
And God said
Man created
And God saw that it was good
Evening and morning a sixth day

COSMOS
The Spirit of God
The Sabbath of Rest.

The last example to which I shall call your attention is the opening division of the Lord's Prayer, which is one of the finest examples of a Hebrew arrangement, sometimes called the Envelope figure. One idea envelops or encloses a number of statements, the primary idea being stated at the beginning of the passage and repeated with emphasis at its close. An instance of this is found in Matthew 7:16–21, "By their fruits ye shall know them."

The Lord's Prayer is usually printed, and also read, as though it were prose. Each of the three petitions in the opening division being read as though it were independent, the words "on Earth as it is in Heaven" being read as though they belonged only to the prayer "Thy will be done." What we really have is an envelope figure, the opening line, "Our Father which art in Heaven," corresponding to the phrase "on Earth as in Heaven." The meaning is:

Our Father Which art in heaven
Hallowed be Thy name
Thy Kingdom come
Thy will be done
On earth as it is in Heaven.

The last line should be understood as belonging equally to each of the three petitions instead of to the last alone.

Is not that part of the Lord's Prayer the embodiment in Great Poetry of the idea which all the Great Poets have sung, a longing, some day to be satisfied, for a complete assimilation of Earth and Heaven, and the Spirit of man to the Spirit of God?

THE ARGUMENTS FOR AND AGAINST EXPERIMENTS ON ANIMALS

By Richard M. Pearce

Professor of Research Medicine, University of Pennsylvania

Provost Edgar F. Smith, in introducing Dr. Pearce, said: "Among the many eminent investigators in our Medical Faculty—among the men devoting their lives to the solution of some of the truly great problems before mankind, is the speaker of this afternoon, who, abandoning practice, is giving the best of himself to reach the truth, through his experimental work aided by a group of students about him—intensely interested in the solution of these vital problems.

"It is only fair for me to say that Dr. Pearce is one of a group of five or six of our medical professors now under indictment, brought about by a local organization. The testimony of our professors, under indictment, will be submitted to the courts at the proper time. Dr. Pearce is not here, therefore, for the purpose of making a defence of any kind, but comes as a scientist, to relate, in his own way, the story connected with the solution of problems which are ever staring humanity in the face. His remarks will be restricted to the true meaning of his subject, and it is my desire that every person in this audience shall clearly understand his position. He is here as an investigator—as a student—and as such I am, indeed, proud to present him to you."

Dr. Pearce spoke as follows:

Is man justified in using the lower animals to increase the health, the happiness and the efficiency of mankind? This is the fundamental question about which centers all discussion concerning animal experimentation. Those opposed to the

use of animals in medical and biological investigation hold that man has not this right, and their contentions are that such use is morally (ethically) indefensible, yields no results of value and is accompanied by great cruelty. Let us keep these three points separate and distinct. Let us not confound the moral problem—the right to use animals—with the question of abuse of this right—cruelty—or with the claim of futility—that no results of value have been obtained.

I. The Moral or Ethical Problem

I think we all agree that whatever power moral principles have to determine human action is derived from one or more of three sources. (1) Moral principles have been accepted as embodying divine law implanted in the consciousness of each individual, or revealed through the inspiration of holy men. (2) They have rested on custom, law, or social and political usage. (3) They have been justified by the happiness and social welfare which it is believed follow on obedience to them. (John Rowland Angell.)

The first of these can be used legitimately by either those favoring or those opposed to animal experimentation and with equal power. No unequivocal aid is furnished to either side of the argument. On the one hand we have the teaching of Buddhism, based on the belief of the transmigration of souls, that man has no right to take animal life or cause animal suffering; on the other we have the Old Testament sanction of the sacrifice of animals as a part of religious form. We find that God spared Nineveh because there was "much cattle in the city," but in Genesis we find that, at the creation, God blessed man and gave him dominion "over every living creature that moveth upon the earth." The Mosaic laws offer many examples of apparent regard for the comfort of animals, as that forbidding the muzzling of the ox and the over-driving of cattle, but if these precepts are to be regarded as the basis of a moral principle, it is difficult to reconcile them with the peculiar religious prescription in regard to the method of slaughtering cattle and fowl.

That the sparrow shall not fall without divine knowledge cannot be quoted in argument if we remember words of Him who said, "ye are of more value than many sparrows."

Indeed, the story of the Gadarene swine tells us how the Great Healer caused the transmission to animals of a disease of the mind, and then caused the death of about two thousand animals by drowning—a scriptural portrayal of animal destruction in the cure of disease on a more stupendous scale than any cited in anti-vivisection literature. These references indicate, I think, that divine precept and religious teaching offer evidence on either side of the question and that thereby no unequivocal decision can be reached.

The second moral principle, that based on custom, in view of the many ways in which man dominates the animal kingdom and the variety of ways in which animal effort and animal products are of use to man, is equally at fault.

Custom, law and social usage in all ages and among all peoples have undoubtedly strengthened man's dominion over the animal kingdom. He has taken to himself "the right to hunt and fish, to slay and eat, to use the horse to carry his burden, and the dog to watch his flocks, the bee to hive his honey, and the hen to lay eggs for him." But more than this, custom and the law have given him the right to interfere with the natural course of the life and habits of animals, to dehorn for his own safety, to geld in order that the animal may be of greater value to him, to deprive the calf of its mother that he may have milk and cream and cheese, and the sheep of its wool that he may have clothes. The elephant is done to death for his ivory and the buffalo almost exterminated that man may have its skin. In these and many other ways has man established the moral principle that he may use animal life for food, for clothing, to give him pleasure, to lessen his labor, to increase his happiness, his wealth and his power. To all this no serious objection has been raised; it is only when man wishes to use animals to aid in the conservation of health that the protest comes. This protest, however, is evidence that the argument

based on the power of moral principle as determined by custom is not convincing to all. If the moral principle based on custom allows man to use animals to attain wealth but not health; to geld the horse or ox for strength or weight or the chicken for flavor of the meat, but does not, in the minds of some, allow him the equally free use of animals for the study of the cause, course and cure of disease, it is evident that custom, though it supports every other use of animals for the benefit of man, is not a satisfactory basis of argument concerning animal experimentation.

Having thus disposed of the intuitive and the traditional views of morals, we come to the third or scientific view; that is, that moral principles are justified by the happiness and social welfare which it is believed follow on obedience to them. On this basis those who believe in the benefits to man of animal experimentation make a statement of moral principle as follows:

"Scientific men are under definite obligation to experiment upon animals so far as that is the alternative to random and possibly harmful experimentaion upon human beings, and so far as such experimentation is a means of saving human life, and of increasing human vigor and efficiency." (John Dewey.)

To this statement of moral principle its opponents reply that the animal experimentation is useless and does not benefit man, in that it has not added to our knowledge of the cause, course and cure of disease, and is, therefore, indefensible.

Now, this negative statement implies that if the results of animal experimentation are of benefit to man, such experimentation is justified. If, therefore, it can be shown even in a single instance that life has been saved or human happiness and efficiency have been increased as the result of such experimentation, the basal moral issue is settled in the affirmative.

II. Practical Results of Use of Animals

A large mass of evidence exists to show that most of the great facts of medicine upon which modern practice rests are the result of animal experimentation. The argument demands,

however, an account of experimentation which in the study of one disease has led to the saving of life or the increased happiness and efficiency of mankind. As an example, therefore, I will use a disease which is well known to the non-medical; in fact, better known than is any other disease: one which takes its toll in every walk and condition of life and which on account of the insidious onset and hopeless prognosis was until recent years the dread and fear of every family responsible for children in the stage of adolescence or which had sent out in the world those who had attained manhood and womanhood. I refer to tuberculosis or consumption—the great White Plague of the civilized world, that one of all diseases which causes the greatest number of deaths, which has in the past led all mortality statistics with a record of one-seventh of all deaths.

Fifty years ago the exact knowledge of the cause, the control and treatment of this disease was nil. Today this disease claims its special hospitals, sanatoria, dispensaries, its special group of diagnosticians and scientific investigators and an army of social workers earnestly attempting to educate the people at large in the means of controlling and eventually abolishing the dreaded scourge. Why should we have this present activity? What happened in the intervening years to raise the hope, now almost universal among all peoples, that tuberculosis can be eliminated?

Let us go back to the years before 1865. The knowledge of the cause and transmission of tuberculosis was then wholly theoretical and even its relation to the condition known as scrofula was not at all understood. Indeed, by as great an authority as Gross, scrofula was considered to be an obscure manifestation of syphillis. The hope-denying doctrine of the inheritance of tuberculosis paralyzed the efforts of all physicians. Theories which ascribed the disease to perverted humors or various types of inflammation turned attention from such facts as suggested infection. It is true that "The Royal Touch" was no longer the favorite cure for the "King's Evil," or scrofula, but the current treatment was no more efficacious and was

largely in the hands of quacks. For 170 years, the period since it had been shown (Sylvius, 1695) that tubercles are the essential lesion of pulmonary consumption, no advance had been made in the knowledge of the causation of the disease, and therefore, as may be readily understood, no advance in the means of its control or cure.

But in 1865 the veil was lifted and by one who, convinced by his clinical observations that the disease was infectious, decided to put his theory to the test of experiment. He brought material from the tuberculous in contact with and inoculated it into rabbits and found that the disease could be transmitted to these animals and from animal to animal; stated flatly that it must be due to a germ and thus took the first step in establishing the fact that tuberculosis is a specific transmissible disease.

But he did more than this; he showed also that a disease of cattle, analogous in its manifestations to tuberculosis in man, could also be transmitted to animals and thus he called attention to the identity of the tuberculous process in man and animals. To us, today, this is a commonplace of medical knowledge, but as mankind slowly appreciated the significance of Villemin's discovery, what a wave of hope must have passed over the medical world. No longer was the dreaded tubercle to be considered as inevitably an inheritance, or as a thing predestined and unavoidable.

We have little exact knowledge of how resignation changed to hope, but we can from the sequence of discoveries and events imagine the attitude of the leaders in medicine at this time. The germ theory of disease was not then definitely established. The hypotheses concerning it were already forming in Pasteur's mind, but he had not yet taken up, if we exclude his study of the diseases of the silk worm, the investigation of the diseases of animals to which later he gave so much of his efforts. Still there was some talk of germs and we can see the scientists of the time pondering over the possibility of tuberculosis belonging in the group of infectious diseases, such as smallpox, diphtheria and the like; and also cogitating concerning the possibility

of the transmission of tuberculosis from cattle to man by means of meat or milk. Whatever their thoughts may have been, we know that it was shortly after Villemin's announcement that the first ideas concerning the transmission and prevention of tuberculosis took shape. Within three years it was shown that tuberculosis, no matter in what part of the body it occurs, contains an infective element capable of causing the disease in guinea pigs. Within five years, again by animal inoculation, it was found that the diseased meat of cattle, as well as their milk, could transmit the disease. Especially important were the experiments of Gerlach in 1870, which demonstrated that tuberculosis resulted in animals fed on the milk of tuberculosis cows and led him to conclude that such milk was dangerous for human beings.

What a wonderful progress was this in five years as the result of simple experiments on rabbits and guinea pigs—contrast it with the ignorance concerning tubercle during the preceding 170 years without such experimentation.

But this was only the beginning. In the ten years, 1870 to 1880, the continued use of animals demonstrated the transmission of the disease by the inhalation of dried sputum, thus establishing the now well recognized fact that it is not contact with a tuberculous individual that is responsible for the transmission of the disease, but that it is the inhalation of the dried sputum floating as dust in the air. Upon such observations are based our present efforts to destroy the sputum before it dries and to keep thoroughly clean the rooms occupied by the tuberculous. It is likewise upon these experiments that municipal ordinances concerning spitting in public places and conveyances are based.

During the same period it was shown that by animal experiment the disease could be recognized in doubtful cases. Several other diseases, affecting especially the absorbent glands, the bones and the cavities of the body simulate tuberculosis so closely that a diagnosis cannot always be made by the ordinary methods of inspection and physical examination, and on account of the small number of bacteria present in such lesions micro-

scopic examination is not always conclusive. Under such circumstances, if a guinea pig is inoculated with the fluid or a piece of the tissue from the diseased part, the animal will develop the disease if the material injected is tuberculous. The importance of this, especially in diseases amenable to surgical treatment, cannot be over-estimated. Not only under such circumstances is an exact diagnosis possible, but time—perhaps the most important element when surgical treatment is demanded—is saved. This type of experimentation had, moreover, another important result. These animal inoculations demonstrated the identity of scrofula and tuberculosis. The confusion concerning scrofula was cleared up; the disease, formerly so-called, became subject to the same methods of treatment as tuberculosis, and the word scrofula dropped entirely, except in a historical sense, from medical literature.

Finally, in 1882, Koch, by discovering the tubercle bacillus, completed the chain of evidence necessary to establish the infectious nature of tubercle upon which depend all our present-day methods of control. In all Koch's work animal experimentation was the main theme. He showed by inoculation that all tuberculous and scrofulous diseases of man and animals are due to the tubercle bacillus. From these lesions he grew the bacillus and demonstrated that when injected into animals a typical tuberculosis is produced. Lupus, a disease of the skin, previously of doubtful classification, was thus brought into the group of tuberculous diseases, and the principle of its treatment established in a correct basis, and many other conditions, variously viewed at that time by the practitioner of medicine were similarly correctly grouped. Thus in seventeen years, by animal experimentation, was information obtained which the previous 170 years of observation failed to give.

I have given these facts in detail because I wish to present to you as clearly as I can, and without possibility of doubt on your part, the way in which animals have been used, in the study of one disease, to elucidate the mechanism of its causation and transmission; and to allow you to come to the logical conclusion

that solely by the use of animals, and by no other method, has been obtained the scientific basis upon which rests the present crusade against tuberculosis. What is the final result for mankind of this animal experimentation? I can give you statistics, as, for example, that in New York City during the twenty years after 1882 the death rate from tuberculous was reduced nearly 40 per cent, and in Boston, for the same period, approximately 55 per cent. Similar statistics might be quoted from English and Prussian mortality records, but to bring home to you the value of animal experimentation in tuberculosis it is only necessary to remind you of your own experience. Those of you who are old enough to look back twenty-five years are familiar with the change of attitude towards this disease—a change from an apathetic hopelessness based on the theory of inheritance and fatal outcome to the present optimism concerning prevention and posisble cure. Even those who cannot recall the earlier period of helpless despair must be cognizant of the present general conception that the disease may be prevented, that those infected may be restored to a life of health and usefulness, and that we may look ultimately to the absolute elimination of the disease.

Hospitals for the special study and the treatment of the curable cases and for the isolation of advanced cases, sanatoria, dispensaries and camps, supported by the Federal Government, by state and city, by charitable organizations and even by labor unions and insurance companies, have sprung up everywhere. City ordinances, special societies, traveling exhibits and university extension systems labor to educate the mass of people concerning the means of preventing infection. Hosts of social workers constantly supervise the hygienic lesson and attempt to minimize the economic loss. Why this ever-widening crusade which culminated in the International Tuberculosis Congress representing all nations? Why this concentrated effort against a single disease? There is only one answer—the realization of the possibility of its ultimate conquest and the ever-growing demand that this conquest be hastened to the end

that the health, the efficiency, the happiness of mankind might be conserved. The Anti-Tuberculosis Crusade rests, therefore, upon a moral principle—the duty of mankind to man. If this moral principle be accepted, then it must be admitted that experimentation on animals is a justifiable procedure.

If, as I have shown, the knowledge upon which the tuberculosis crusade rests was won solely by animal experimentation and could only have been so won, it follows that such experimentation, in that it saves human life and increases the sum total of human vigor, is a moral obligation.

Let me put it squarely—if you accept the moral principle of the present anti-tuberculosis movement, you must accept animal experimentation as a moral principle, for without animal experimentation we would have no anti-tuberculosis movement and no hope for the consumptive and his dependents, and the world's greatest effort in "Man's Redemption of Man" would never have been.

The story of tuberculosis demonstrates beyond the power of contradition by persons of logical mind, that in at least one instance, experimentation on animals was justified by its results. If this is granted the basal ethical issue is closed and the conclusion is inevitable that not only are scientific men under a well recognized moral obligation to use animals as a means of aiding mankind, but that equally, "The community at large is under definite obligations to see to it that scientific men are not needlessly hampered in carrying on the inquiries necessary for an adequate performance of this important social office of sustaining human life and vigor." (John Dewey.)

Before taking up other aspects of the argument, I wish to present a brief summary* of the practical achievements of medical investigation which are the direct result of animal experimentation, or are based on the principles concerning disease which have been established through such experimentation.

* This summary with slight modifications is that prepared in 1912, by Dr. W. W. Keen. See pamphlet XXIV of A. M. A. series, "The Influence of Antivivisection on Character."

Experiments on Animals

1. The discovery and development of the antiseptic method which has made possible all the wonderful results of modern surgery.

2. The practical development of modern abdominal surgery, including operations on the stomach, intestines, appendix, liver, gall stones, pancreas, spleen, kidneys, etc.

3. The development of the modern surgery of the brain.

4. The new surgery of the chest, including the surgery of the heart, lungs, aorta, esophagus, etc.

5. The almost complete preventing of lockjaw after operations and even after accidents.

6. The reduction of the death rate after compound fractures from two out of three, *i. e.*, sixty-six in a hundred, to less than one in a hundred.

7. The reduction of the death rate of ovariotomy from two out of three, or sixty-six in a hundred, to two or three out of a hundred.

8. The reduction of the death rate after operations like hernia, amputation of the breast and of most tumors so that it is now almost a negligible factor.

9. The abolition wherever the proper measures are taken, in this country and the Canal Zone, of yellow fever.

10. An enormous diminution of the ravages of malaria, and in some places its total abolition.

11. The reduction of the death rate of hydrophobia from 12 to 14 per cent of persons bitten to 0.77 per cent.

12. The development of a method of direct transfusion of blood which has already saved very many lives.

13. The reduction through the use of anti-toxin of the death rate of diphtheria all over the civilized world. This reduction shows a change from a mortality of 79.9 deaths per 100,000 of population in 1894, to 19 deaths per 100,000 in 1905.

14. The reduction of the mortality of epidemic cerebrospinal meningitis from 75 or even 90 odd per cent in the absence of serum treatment, to 20 per cent and less when the specific serum is used.

15. The cutting down of the death rate of tuberculosis by from 30 to 50 per cent. This is due not to treatment by serum or vaccines, but to methods of prevention based on the knowledge of the cause of tuberculosis.

16. In the British Army and Navy, Malta fever has been abolished. In 1905, before the successful researches on this disease, it attacked nearly 1,300 soldiers and sailors. In 1907 the army had only eleven cases; in 1908, five cases; in 1909, one case.

17. The almost complete abolition of childbed fever, the chief former peril of maternity. Its mortality has been reduced from five or ten or even to fifty-seven in every hundred mothers to one in 1,250 mothers.

18. The discovery of a remedy (Salvarsan), which bids fair to protect innocent wives and unborn children, besides many others in the community at large, from the horrible curse of syphilis.

19. The discovery of a vaccine against typhoid fever, which in the recent army maneuvers on the Mexican border prevented the development of typhoid among the soldiers, which in hospitals has greatly reduced its incidence among nurses and which is now coming into general use in all places where infection is possible. The improved sanitation which has helped to reduce the typhoid death rate in this country is itself largely the result of bacteriologic experimentation.

20. Many recent activities indicate that we are gradually nearing the discovery of the cause, and then we hope of the cure, of several of the dreadful scourges of humanity, as cancer, infantile paralysis, pellagra, and that diseases of the tropics, such as sleeping sickness, etc., are about to come under man's control.

21. Finally, it may be pointed out that animals themselves have been enormously benefited for by discovering the causes, and in many cases the means of preventing tuberculosis, rinderpest, anthrax, glanders, hog cholera, chicken cholera, lumpy jaw, distemper and other diseases of animals, animal suffering

has been greatly diminished. To this aspect of the subject, the efforts to reduce animal suffering due to disease, I will return later.

III. The Charge of Cruelty

We may now turn to another aspect of the controversy, the charge that animal experimentation is unnecessarily cruel and is demoralizing and brutal in its influence, both on those who conduct it and those who observe it.

I will take up first, because we can deal with facts, the abstract question of cruelty, and leave for later consideration the philosophical discussion of the influence of animal experimentation on character and morals. The discussion of cruelty may be presented from any one of several points of view. It could be shown that in their evidence concerning specific incidents of alleged cruelty the opponents of animal experimentation always omit the very important fact that the animal in question was thoroughly anesthetized, usually by ether or chloroform or some mixture of these with alcohol, and could not have felt pain; or it could be shown that their descriptions are so altered or so isolated from the context that incomplete or garbled accounts of the procedures which they cite are given; and again, that on account of their lack of technical, biological and medical procedures, they minimize some facts or procedures, magnify others or altogether misinterpret what they read. Moreover, much of the evidence is in connection with experiments made many years ago—some of them before the days of anesthesia, and almost entirely in distant countries. The evidence presented concerning experiments in this country is, on the other hand, presented without statements as to anesthesia and with more or less distortion of facts. It is not difficult to understand such misinterpretation. To the average individual the word vivisection means the use of the knife in an operation upon a living animal. To this definition the anti-vivisectionist adds the words "without anesthesia," and this interpretation they read into every experiment on animals. Animal experimentation is,

therefore, to them the highest form of cruelty, and they feel justified in reporting any and all experiments as such by the simple process of omitting all reference to anesthesia.

The falsity of the evidence thus presented can be shown in two ways: (1) by analyzing the evidence they present in their pamphlets and pointing out its omissions and inaccuracies, particularly in the matter of anesthesia, and (2) by showing that the great majority of experiments are really not operative experiments. Thus the official figures for Great Britain for 1909 show that of all animal experiments, 93.96 per cent were simple inoculations not involving any cutting operation. Of the remaining small number, 3.44 per cent of the animals were killed under an anesthetic and only 2.6 per cent were allowed to recover from anesthesia, and on these no second procedure liable to cause pain was allowed without further anesthesia. The medical research of today is only to a small degree a continuation of the physiological type of experiment which its opponents so dearly love to quote. It is rather a study of the methods of chemistry and bacteriology, of diseases artificially reproduced. In these, the knife plays only a minor rôle and in the majority, none at all. Such statements, however, are not accepted by the opponents of animal experimentation. To the declaration of the medical investigator that complete anesthesia is the rule in all but inoculation experiments or other simple procedures of like nature, in which the pain is equivalent to that caused by a hypodermic injection, the anti-vivisectionist replies that he, or perhaps better, she, has no confidence in the claims of anesthesia, is convinced of the existence of torments, and that all medical investigators are "human monsters" and their work "a plague of scientific cruelty."

Under such circumstances it is of course impossible for the exponent of animal experimentation to convince his antagonist that cruelty does not exist; on the other hand, the anti-vivisectionist cannot persuade the investigator that he or she wishes to know the truth. It would seem that the publication in detail in a scientific journal of all procedures in an investigation would

be sufficient to convince the most prejudiced of the accuracy of statement in connection with any group of experiments. The investigator accustomed to the exact methods of science knows that if he wishes the results of his work to be accepted by his colleagues, every detail of his work must be accurately and truthfully presented; otherwise he becomes discredited and his work receives no attention. By such publication, the medical investigator, as does every worker in pure and applied science, place before a critical scientific world his problem, his methods and his opinions based on the results of his work. He cannot leave out or insert any fact which bears on his methods. Truthfulness of statement is essential. Such printed accounts demanded by the scientific world, the anti-vivisectionist will not accept. Sometimes simple doubt is expressed; at other times, accusations of deliberate lying are made; and in those instances in which such published accounts are reproduced, they are so altered, or sentences are so quoted without their context as to give a false impression.

Under such circumstances it is a waste of time and effort to attempt to bring the active opponents of animal experimentation to a different point of view, and this attempt the medical men have abandoned. They do, however, desire to place the evidence on both sides fairly and squarely before those who are non-partisan, or are in doubt, or who, having no definite opinion, seek more information.

For this reason I am going to discuss some of the methods which are used to give the impression that cruelty is practiced by medical investigators—and I will not select for this discussion things which are said to have happened thirty, forty or sixty years ago, in England or Germany or France, but will speak only of matters that any Philadelphian can investigate at first hand.

The American Anti-vivisection Society, which has its headquarters in this city, presents annually an exhibit which purports to demonstrate the horrors and uselessness of animal experimentation and of medical investigation and practice in

general. It is truly a chamber of horrors based on untruths, misrepresentations and exaggerations. Of greatest interest in showing the methods of misrepresentation is the picture labeled, "A Vivisected Product of a Philadelphia Laboratory." This picture, as well as the wax-encased specimen from which the picture was taken, shows a dog with wounds of the chest, the left fore leg and the left hind leg and an incision in the neck from which a tangle of string emerges. The legend states that "the string was placed around the trachea during life—the object being to observe the effect of gradual strangulation on the respiratory heart and nervous system." Now, in 1911, when the attention of medical investigators in Philadelphia was first called to this picture, the head of every laboratory, of every medical school and of every biological department in the city of Philadelphia was consulted as to the possible nature of the alleged experiments. All records were examined and the memory of every person doing experimental work was prodded to recall any possible procedure which could be so depicted. No information could be obtained. It was the unanimous opinion of all who saw the picture, or the specimen in the exhibit, that with the possible exception of the wound in the neck, the picture represented dissection after the animal was dead. At the time of this investigation I wrote to the president of the American Anti-vivisection Society, pointing out the misconception in their statements and asking for information concerning the laboratory from which the animal was obtained. I received a reply from the vice-president, in which my explanation was ignored entirely and I was informed that "it is not considered fair at present to specify any one individual or institution, when there are so many in which cruel experiments are carried on," (Signed, E. C. Easby). It did not occur apparently to the writer of the letter that it was hardly "fair play" to throw suspicion upon all Philadelphia laboratories when the animal in question was procured from only one. Later, Dr. Allen J. Smith, then dean of the Medical School of the University, likewise pointed out the evidence of post-mortem dissection

and asked for more information concerning the exhibit and its sources, but was denied such in a letter signed by the secretary of the society. I have cited these experiences in detail to show how unwilling the officials of the American Anti-vivisection Society are to substantiate the authenticity of their exhibits. But now observe how the story grows. The legends accompanying the original picture referred only to the wound in the neck and said nothing about anesthesia. This fall the picture again appeared with a legend in red ink stating that no anesthesia was used, that "the wound in the breast was made in order ro reach the heart, and prick it at intervals to note the effect of such irritation," that "this dog was used for grafting of bones or a part of the body," that "yearly numerous dogs are so used, a certain portion of the body is removed from the dog, and another dog tied to it, and the corresponding portion of the second dog is grafted by ligatures and pressure; both animals are held in position to see if one portion will grow on the other animal; one or other victim generally dies at the fourth or fifth day."

Despite the obvious impossibility of such multiple procedures, with or without anesthesia, further incongruity is added by repeating the legend of the first picture, that the string in the neck was for the purpose of observing the effect of gradual strangulation. These descriptions are said to be by a doctor. Simple denial should be sufficient to convince any sensible person that such procedures as those described are surgically impossible, but if such denial is not sufficient, their falsity can be shown by the fact that on inspection of the specimen at the exhibit it could be seen: (1) that the wound in the chest does not expose the heart, and therefore irritation of the heart was impossible; (2) that the strings in the neck are apparently (the position of the strings is not clear) not about the wind-pipe, but about the blood vessels, and suffocation would, therefore, be impossible; (3) that the mutilations of the legs show no evidence of suturing of blood vessels, muscles, tendons or skin, which would have been an essential part of the operation if grafting had been attempted. Finally, it is impossible that any one

would attempt a grafting to another dog and then jeopardize the success of such an attempt by suffocating one of the animals.

I have given these details, disagreeable as they must be to you, to show how crude these misrepresentations are. But crude as they may be, they impress those unfamiliar with medical and surgical practice and it is upon this, not upon the truth of their statements, that their authors rely. As the truth of this whole matter could be cleared up by a simple statement as to the source of the animal in question, I again wrote (November 24, 1913) to the president of the American Anti-vivisection Society for information and was informed by the vice-president that she did "not consider it expedient to add to, or to vary, the matter contained in my former letter of 1911 (Elizabeth C. Easby), to which I was referred for information. Despite this correspondence, the specimen is still to be found (November 29th) in this year's exhibit of the society and the same picture is distributed. The legends sometimes credit the animal to an "American laboratory" and sometimes to a "Philadelphia laboratory," and in some the statement that the alleged experiments were done without anesthesia has been removed. False statements concerning the exhibit have not therefore been modified, but it is to be hoped that even though the society cannot appreciate the principles of fair play, they may come in time to realize that false statements hinder rather than help their propaganda.

Another animal in this exhibit also represents, it is said, an experiment without anesthesia. Any person with the faintest conception of the physiology of the important structures of the body must be convinced of the absurdity of this exhibit. The animal is one upon which an autopsy has been made after death. An incision extends the entire length of the body and all the viscera have been removed except the liver and a portion of the lower end of the intestine. It is evident that without lungs for respiration, without a heart to pump the blood, or without the larger blood vessels to carry the blood, experiment was impossible. One might as well select the dressed carcass of a sheep

in a market and label it as an example of experimentation by a veterinarian.

Other exhibits are equally misleading. The picture of apparatus for holding open the jaws of a dog which is taken from a German instrument catalogue, I have never seen in any laboratory. The oven with the rabbit has some basis in fact in that Claude Bernard made experiments on the effect of heat in the early seventies of the past century, but the oven is not that used by Bernard, and as far as I can discover experiments similar to those he made have never been repeated. Both these exhibits are planned to give the impression that the apparatus shown in each is in common use in every laboratory. I doubt if any American investigator ever saw either piece of apparatus except in this exhibit. Indeed, from a perusal of the letter attached to the oven it would appear that it was made by the manufacturer at the request of the American Anti-vivisection Society, and inspection of the oven indicates that to accomplish this the manufacturer modified an oven planned originally for the incineration of refuse.

IV. So-called "Human Vivisection"

These are typical examples of the evidence upon which the charge of cruelty to animals is based; but the charge does not stop here; it includes charges of what is termed human vivisection. Now, the term human vivisection is a very appropriate term for any surgical procedure done on man, but it is not this that is meant. The term is used rather for various diagnostic procedures or curative inoculations which have developed recently, from which modern medicine has derived so many benefits and upon which it bases its hope of future control of the infectious diseases. I will refer to only one of these procedures as presented in the exhibit of the American Anti-vivisection Society. A picture shows a nurse and a physician standing on either side of a table upon which is a child lying prone. The physician is apparently about to perform the simple procedure known as lumbar puncture, that is to remove for purposes of

diagnosis and treatment a small amount of fluid from the spinal canal. This is the routine procedure in all cases of known or suspected meningitis and consists of the introduction into the spinal canal, at a point below the termination of the spinal cord, of a thin needle through which flows out some of the spinal fluid. Now, meningitis may be due to the tubercle bacillus or the streptococcus, or pneumococcus or other bacteria for which forms we have at present no specific treatment, but if it is of the epidemic type, due to the diplococcus of Weichselbaum, it may be treated by Flexner's serum. The humane and life-saving procedure, therefore, is to determine the type of meningitis, and this can be done only by examining the fluid from the spinal canal. As the fluid can be removed only by lumbar puncture, the diagnosis depends absolutely upon this procedure. Moreover, if the type of meningitis is found to be that amenable to treatment by a specific serum, this curative serum has its effect only when introduced into the spinal canal and this again must be by lumbar puncture. Now, this—a procedure which has reduced the mortality from meningitis from 75 or 90 per cent according to various statistics to 20 per cent or less—is called human vivisection, and for what reason? Merely because the anti-vivisectionists disregard the facts of mordern medicine and deny the value of serum-therapy. If this is human vivisection, then all surgery is human vivisection.

V. Co-operation of Anti-vivisectionists with Anti-medical Movements

This brings me to one very significant fact in connection with the recent exhibit in this city—evidence of the apparent co-operation of the anti-vivisectionists forces with an organization having for its object opposition to the Federal control of matters of public health. Among other literature on the tables at the exhibit (November 29, 1913) of the American Anti-vivisection Society was the publication (Vol. I, No. 2, and Vol. II, Nos. 8 and 10) of the National League for Medical Freedom. This publication states that the object of the League is to "protect

the people in one of their most sacred rights, the right of every man to select the practitioner of his choice in the hour of sickness," but its real object, as is evident elsewhere in its pages, is to oppose the control by the government of matters of public health. In other words, it is opposed to government bureaus which might have charge of quarantine, health legislation, the control of water supplies, sewage disposal, pure food regulations, school inspection and other problems which would thus have a Federal regulation and uniform enforcement. No matter what views one may have about state rights or schools of medical practice, no one, I believe, who has the welfare of his fellow men at heart, desires to oppose regulations which tend to decrease disease in his own community or that of his neighbor. The opponents of animal experimentation, by distributing the literature of the League for Medical Freedom, indicate that they are opposed to such humane effort and thus offer added proof of their opposition to the principle that the community at large should benefit by the fruits of medical investigation. Thus does sentimentality obscure wise public policy and the dictates of humanity.

VI. An Anti-vivisectionist Letter

This reference to sentimentality reminds me of a letter received a few years ago by Dr. W. W. Keen, of this city. It represents the attitude of some, at least, of those opposed to animal experimentation and was called forth by a particularly able demonstration of the practical benefits resulting from medical investigation, which had appeared under Dr. Keen's name in *The Ladies' Home Journal* for April, 1910. I may explain that Dr. Keen is not and never has been what is called a vivisector, but he has, however, always been an advocate of animal experimentation, because of his knowledge of how greatly this practice has helped him in saving life and lessening suffering. Perhaps no man in Philadelphia is so well and so favorably known to his fellow-citizens. A helpful, kindly spirit and an intelligent sustained interest in all movements for the better-

ment of his fellow-citizens have always characterized his labors.

The letter was typewritten and without date or signature. It read as follows:

ARCH-FIEND:

I read with horror your article in the *Ladies' Home Journal* on vivisection.

I hope your mother if she is living will die in the most terrible torture, and if she is dead that her soul will never know rest for having given life to such a vile monster as you is the nightly prayer of

a dozen women who indited this.

Comment is unnecessary, except to say that as far as Dr. Keen is aware this letter has never been repudiated by any group of anti-vivisectionists as a false statement of their attitude.

VII. THE QUESTION OF THE OPEN DOOR

Now a word about a frequently reiterated contention of our opponents—that they cannot gain admission to our laboratories. They can if they wish. They have been invited, but have never accepted the invitation. Two years ago at the hearing at Harrisburg, representatives of two of our medical schools offered to open their laboratory to those who claimed they could not enter. Again last year at a legislative hearing, the dean of the Medical School of this University again stated that our laboratories were open to all who had a serious object in visiting them. Several laymen have accepted this invitation, but the officers of the American Anti-vivisection Society have not.

At an exhibit of the American Anti-vivisection Society two years ago, Dr. Allen J. Smith, then dean of the Medical School, in conversation with Mrs. Easby, offered to allow her the freedom of the University laboratories and animal house and later (February 21, 1912) wrote Mrs. Easby reminding her of this offer. These invitations were of no avail, for no member of the society has either officially or in a private capacity visited the University laboratories. Despite this effort on our part, Mrs. Easby, at the recent exhibit, assured one of the sight-seers that

entrance to experimental laboratories was impossible, and with this coupled the statement that anesthesia was not used in any of the operations. As it happened, the young woman to whom these statements were made was our operating-room nurse, who not only has charge of every operation, but administers the anesthesia and knows how frequently strangers come not only into the laboratory, but as well into the operating room itself.

At another time when a member of the American Anti-vivisection Society attempted to obtain by telephone, from my secretary, information concerning a discharged janitor, and the work of my assistants—one end of the conversation being overheard by me—I offered in writing to place myself and my entire staff at her disposal in order that there should not be that misconception about the work of my department which might perhaps arise through incomplete investigation. This offer was refused and the statement made that "Should such curiosity move me at any time to an investigation of your departmental work, I should doubtless be able to satisfy it without intruding on your time or good service. . . ."

It was the same young woman who, walking by the University Hospital, heard cries coming from the maternity wards of the University Hospital, and insisted that the sounds came from a tortured dog. When she was taken to the wards and found only babies and no dogs, her mind apparently turned to her delusion of human vivisection, for she pointed to a prematurely born infant with the yellowish discoloration of jaundice, common in such children, and asked if it had not been the subject of experiment! This incident is most characteristic of the point of view with which the anti-vivisectionist approaches the domain of medical science and illustrates the hopelessness of expecting them to accept the usual methods of reaching the truth.

But to return to the question of the so-called closed door, the locked door, etc., of our "halls of torture." What is the situation in the laboratories of the Medical School of the University of Pennsylvania? I know of no laboratory which cannot be

entered by the simple process of opening the door without knocking. No one guards the doors within or without—messenger boys, expressmen, come and go, and wander through the rooms until they find the person they want. Strangers, physicians and laymen visiting the building are shown through all the rooms, whether experiments are going on or not. Within the last month three ladies, with only one of whom I was acquainted, swept through the department, heading for the operation room, and as they passed me, said, "We want to see an operation we are told is being done this morning." Without comment, I called my secretary and sent her with them to the operating room. There they saw an operation performed with all the care and caution and cleanliness of a modern surgical operating room and a young woman, trained to the work, administering the anesthetic. I did not stay with them and did not see them again, but I was told that they afterwards visited the animal house. I made no inquiries concerning their impressions and no opinion was expressed to me. This experience is open to anyone. Go to the exhibit of the American Anti-vivisection Society and get your impressions of horror and then come to the University and see the true methods of procedure in animal experimentation. My department is open for inspection to anyone who has motives other than those of mere idle curiosity, and such a person may see any experimental procedure which is demanded by the problems under investigations at the time. In offering this invitation I make only one reservation, and that is, if the procedure involves an operation, this person must first have seen an operation on man in order that he or she may be familiar with the details of administering ether, the operative technique of a surgical clinic, the appearance of an open wound and the conditions which sometimes accompany recovery from anesthesia. I ask this merely because it is necessary in reaching an opinion to have the latter experience for comparison. Let me repeat, with this provision concerning the previous observation of an operation on man, this invitation is to each one of you here present and to anyone who may read these lines.

One other point I wish to make in connection with the question of publicity. We realize that among the animals brought to us, most of which are ownerless mongrels, may however, be the "lost, strayed or stolen" animal. To guard against the use of such animals in our investigations, every animal is held for ten days for the inspection of anyone who may come to claim it. During the year ending November 30, 1913, 122 persons took advantage of this opportunity and, accompanied by a member of the faculty; inspected freely and without restraint all animals held under this rule as well as animals which were recovering from various operative procedures. In some instances the animal sought has been found in our kennels and has been willingly restored to its owner; in many cases we have heard later from the owner that the animal had been found elsewhere or had returned home of its own accord. In very few instances have we felt that we have not had the confidence of the person seeking a lost animal and, as a rule, we have received not merely perfunctory thanks but an expression of appreciation of our co-operation. But the point I wish to make is this—an average of ten persons a month have visited the kennels during the past year; persons of all walks of life, men and women, young and old, of whom we have asked no questions other than those concerning the lost animal. No one has been denied admission and no one has been prevented from making a complete search of the kennels, and not once has there been an expression of opinion indicative of outraged humane sentiment or even of displeasure at the conditions observed. During the past two years, according to our records, 225 persons have taken advantage of this opportunity of seeking lost animals. Their inspection was by daylight, attended by every assistance possible on our part and not hurried or hampered in any way.

VIII. The Study of Animal Diseases

I wish to refer to one aspect of this general subject which has always been a mystery to the medical investigator. The latter has constantly before him the ultimate aim of all his labors—

the relief of human suffering through the attainment of an increased knowledge of the cause, course and cure of disease. He may use animals in these investigations with the object of eventually applying the results of his studies to man, but incidentally he obtains information which is of use in controlling the disease of animals themselves. In other instances the investigator, as in our State and Federal laboratories, undertakes the study of animal diseases which are of importance for commercial and industrial reasons and the control of which is a matter of economic interest. But despite this primary economic interest, the results of such studies have another value in that they lessen the amount of animal suffering from disease and thus have a bearing on humane effort which cannot be disregarded.

From the time when Pasteur made his studies of the disease of the silk worm and later of anthrax in cattle and the disease known as chicken-cholera, a vast number of animal diseases have been studied for their own sake by the men who at the same time use animals in an experimental way for the elucidation of the diseases of man. The list ranges from malaria, tuberculosis and infectious abortion in cattle to the infections of barn-yard fowls and wild birds and the tumors of fish.

On the other hand, the various societies established for the protection of animals as those for the prevention of cruelty, the humane societies and the anti-vivisection societies, have taken no share in the study of the cause, course, prevention and cure of the natural diseases of domestic animals. The horse is protected from the carelessness of its driver or owner as to the whip, insufficient feeding and inclement weather. The child is taught gentleness in his relation to animals; the rigors of the transportation of live animals are lessened, efforts are made to reduce the cruelty of the slaughter-house, and advice is given as to more humane methods of shooting and trapping wild animals. These and many other activities in the prevention of suffering in both wild and domestic animals are conscientiously encouraged by these societies, and their efforts have the support of every person of humane sympathies. But when it comes to the study,

relief or cure of suffering due to disease, they have no remedy except the death-chamber. Ambulances are furnished to take away from the house, the stable or the street, the sick or disabled horse; animal catchers and carts are furnished to remove the stray dog or cat; everything is done to minimize the annoyance to finer sensibilities of the presence of a sick, or the inconvenience of a stray or ownerless animal, but man's responsibility in the matter of animal disease is, by these societies, entirely neglected. The reports of these societies show that thousands of dollars are available for the killing of the cat and dog, but not a cent for the study of the diseases and injuries of these animals.

Within the last few weeks a New York paper quoted an officer of the American Society for the Prevention of Cruelty to Animals as saying: "We will gather 300,000 small animals this year. Seventy-five per cent are cats and the rest dogs. In the three days so far this week we have seized 600 dogs. In the Bronx alone we gathered in 177 on Monday, 180 on Tuesday and 60 to-day. We are concentrating our energies in the Bronx right now because of a scare of rabies there. We now have thirteen ambulances at work, ten of which are motor-driven vehicles." Just think what this means. The expense of thirteen ambulances, ten of them motor vehicles, to collect dogs and cats and not a cent to study distemper, mange or any other disease of these animals.*

What benefits to the dog and the cat might have resulted from the selection of a certain number of the diseased among these animals for the purpose of scientific study. Is the practice which destroys animals by the hundreds of thousands because they are in the way or because in their illness they disturb the sensibilities of their owner, but which will not attempt to diminish suffering among animals by the investigation of animal diseases, based on a sound moral principle? Should not those who desire to prevent suffering among animals be the first to support the study of the diseases of animals and thus labor to reduce an

* The American S. P. C. A. has in New York a small hospital which can care for 24 dogs and 14 cats. It is used, however, only for treatment and not for the study of animal diseases.

amount of suffering which is immeasurable as contrasted with the occasional distress due to man's carelessness or indifference? To some extent our veterinary schools and private individuals have established hospitals for the treatment of animals injured and diseased, but the financial burden has, as a rule, limited their work to animals of commercial value and to actual treatment, not scientific study. No one has yet taken up the question of the care of the dog or cat belonging to the individual of small or moderate income who cannot afford to have an X-ray made if his dog has a broken leg, or to have him treated for mange over a long period of time, or to have a laparotomy for intestinal obstruction, hernia or the removal of a tumor. The private hospital charges are too great and so the owner telephones to the humane society and the dog's life is ended by means of charcoal fumes. One cannot avoid the conclusion that the easiest and least expensive way is, in the opinion of these societies, the best.

That the establishment of clinics for domestic animals in connection with experimental laboratories is of value, not only in the obtaining of a better knowledge of animal diseases, but also in perfecting the methods of treating such diseases, is shown by the data gained in these two respects by Dr. Harvey Cushing in the animal clinic maintained in connection with the Hunterian laboratory of the Johns Hopkins Medical School. The reports of this clinic present a large mass of knowledge gained by the study of tumors, hernia, cyst of the thyroid, etc., occurring in dogs, and of the method of operative interference necessary for the treatment of the conditions—facts which have their chief value in the benefits which accrue to the dog and are of benefit only incidentally to man. Effort of this type should be one of the main objects of societies established for the prevention of cruelty to animals—for in ameliorating the suffering due to natural diseases or in preventing these diseases, they would do more to lessen actual suffering than is possible by their present methods of which the most important is the death-chamber. That these societies have, however, little interest in this phase

of work, is shown by the announcement of the "International Anti-vivisection and Animal Protection Congress" held in Washington during the second week of the current month. Of the twenty-seven sub-divisions of the subject matter discussed by the Congress, thirteen have to do with the protection of domestic and wild animals (including trapping of wild animals, protection of birds and the problems of the zoological garden). An equal number have to do with the question of vivisection, various phases of animal experimentation and objections to important lines of progress in medicine and surgery. One subdivision only refers to "Animal Hospitals and the Progress of Veterinary Science," and no space is given to the most important of all problems concerning animal welfare, the scientific study of the cause, prevention and cure of their natural diseases. The avowed object of this congress is "To advocate a consistent opposition to all forms of cruelty to animals." But the most rational line of effort, full of the greatest promise in the prevention of animal suffering—the scientific study of animal diseases—this congress neglects entirely.

The anti-vivisection societies cannot, of course, accept this principle of lessening animal suffering by preventing animal disease, for if the principle of experiments on animals for the sake of the study of animal diseases were adopted, it would naturally justify the use of animals for studying the diseases of man. Still, I would recommend to the American Anti-vivisection Society that it set aside for five years half of its income, say two thousand five hundred dollars a year, for such study by well-trained men. I would guarantee that the results would be such that they would no longer talk about the selfishness which they claim is shown in the argument that man has a right to use animals for his own welfare and well-being. They would at the end of five years have obtained such an insight into the frequency and the character of the natural diseases of the dog and the cat that they would be justified in a feeling of great satisfaction at having done something of real value in preventing suffering among animals. This consciousness of having thus been

of some real use in alleviating animal suffering might cause them to view with kindlier eyes the medical investigators who labor for man as well as beast.

Now what I have had to say has been not to those of my audience who believe in the moral principle underlying animal experimentation, nor yet to those who declare that medical investigation as at present practiced is a snare and a delusion. The former base their belief on the rock of exact scientific observation and are convinced by the everyday practical applications of experimental evidence that the methods of medical investigation have in the past accomplished great good for humanity and that they promise even greater success in the future. This group has back of it the great force of exact scientific thought. The opposing group is without basis for its opinion other than that of unorganized individual thought. Its members deny the value of the accumulated knowledge of the centuries, reject the germ theory of disease upon which modern sanitation is based, accept no evidence which is not in accord with their views, and even when their statements are shown to be false, continue to repeat them without regard to scientific accuracy or the fundamental concepts of simple honesty and fair play. It is neither of these groups that I hope to influence. The individual who supports his position with evidence in accord with modern scientific thought cannot readily be moved. No more can he who, ignoring fact, bases his opinion upon the principle of individual thought, opinion and sentiment.

It is to a third and the largest group, those who are indifferent or in doubt, that I present my argument—to such I would characterize animal experimentation as essential to the attainment of that knowledge of the cause and course of disease upon which rational and scientific treatment must be based, and as embodying in practice that idea of social service, of effort in the behalf of others, so significant at the present time, of every progressive movement which tends to raise mankind to a higher level of usefulness. Christ's redemption of man is the great

central truth of the Christian religion. Should those who believe in this fundamental spiritual truth oppose the physical redemption of man by man? Such opposition has been and is today the attitude of the opponents of medical and biological investigation. Mr. Henry Bergh, at one time the president of the New York Society for the Prevention of Cruelty to Animals and for many years the leader of the anti-vivisectionists in this country, characterized as "profane" the procedure of opening the veins of an apparently dying person in order to inject blood in the hope of preventing a fatal outcome. He characterized such effort as "thwarting the decrees of Providence" in "snatching away from its Maker a soul which he had called away from earth!"

Such a point of view is not that of the great majority of the community, who realize that the physician no longer holds himself aloof from a share in the activities which determine the social welfare of the great mass of people. Moreover the community realizes that the science of bacteriology and the knowledge which it has popularized concerning the cause and control of disease and pestilence, formerly considered as foreordained and without remedy, has brought to the race a new hope concerning many of man's afflictions, and this hope is tinctured with an impatient demand that preventable diseases, whether due to infection or occupation, or to the vaguely understood conditions of habit, diet or environment, should be thoroughly investigated. The public looks first, and naturally so, to its state and municipal laboratories and departments of health, for assistance, but it looks to the laboratories and hospitals of the universities for that wise guidance and direction which, untrammeled by false preconceptions or by an anti-human or anti-humane sentimentality, is the result of impersonal scientific observation and experiment.

To this larger public, which is in the last analysis responsible for the shaping of our important principles of public policy—and accomplishes this through moulding the trend of public opinion—may be left the question of how medical research is to

be conducted. To such I commend the words of the former president of Harvard University: "Medical research habitually strives to arrive at something beyond abstract truth. It seeks to promote public and private safety and happiness, and the material welfare of society. Its devotees have in mind the discovery of means of remedying misery or warding off calamity; and they know that whatever contributes to health or longevity in any community or nation contributes to its industrial prosperity; so that they are justified in hoping for results from their work which will promote human welfare."

(I desire to acknowledge my indebtedness, in connection with the preparation of this lecture, to the committees and the writers responsible for the pamphlets on Defense of Research, published by the American Medical Association and the Committee on Experimental Medicine of the Medical Society of the State of New York; and in particular to those by R. J. Angell, John Dewey, W. H. Park, W. W. Keen and W. B. Cannon. I also acknowledge a quotation from *The Outlook* of April 9, 1904, p. 812, and a utilization of the idea expressed in Sir William Osler's "Man's Redemption of Man.")

CERVANTES

By Hugo A. Rennert

Professor of Romanic Languages and Literatures,
University of Pennsylvania

The tercentenary of the first appearance of "Don Quixote," celebrated a few years ago, and the discovery in 1911 of what the Spanish Academy regards as a genuine portrait of Cervantes, have again brought the greatest of all Spaniards somewhat more prominently before the general public. Not that Cervantes' fame has suffered any eclipse—for his masterpiece is more read throughout the civilized world than ever before. New editions and translations are constantly appearing. In fact, for the last two decades Spanish scholars have been busier than ever, searching for documents that might throw even the slightest light upon the greatest figure in their literature.

Happily, their investigations have met with success beyond all expectations. The most authoritative life of Cervantes that we possessed till recently is that of Navarrete, published in 1819. Here the first attempt was made to substitute facts based on historical documents for mere conjecture. As Navarrete published a number of these documents in his *Vida de Cervantes*, his volume became the mine from which all subsequent biographers drew their material. A few documents had been discovered since Navarrete's day, but no substantial progress had been made until 1897, when Cristobal Perez Pastor published a volume entitled "Documentos Cervantinos," containing fifty-six contemporary documents. This he supplemented in 1912 with a second volume containing 105 additional documents; in all, 161 new documents which were brought to light by his researches.

They tell us much that we did not know, although there are still many blanks in Cervantes' life. What these documents unfailingly reveal is the extreme poverty of Cervantes—scarcely

a ray of sunshine lights up the squalid existence which he bore so uncomplainingly and with such unconquerable buoyancy of spirit. It is in the light of these newly discovered documents that his life must now be considered.

To provide their heroes with an imposing line of ancestors stretching back into the nebulous, past is a weakness to which the biographers of great men are exceedingly prone. Cervantes was not fortunate enough to escape this foible, and accordingly we find that his family has been traced back to a somewhat shadowy Tello Muriellez, who died towards the close of the tenth century. As a matter of fact, we can follow the immediate family of Cervantes back no further than two generations. His grandfather was Juan de Cervantes, who, in a deed executed on May 13, 1533, describes himself as a *licenciado*, which meant, in all probability, a licentiate in law. So far as we know he was an humble country lawyer who died obscurely towards the close of the sixteenth century. The names of this Juan de Cervantes' parents, and the date of his death are not known. From the deed just mentioned we learn that Juan de Cervantes had a son Andres and a daughter Maria, but there is no record of the birth or baptism of their brother Rodrigo, who is presumed to have been their junior. In two legal documents Rodrigo speaks of himself as a *medico çurujano*. He was an humble apothecary-surgeon who moved from place to place, attending such few patients as luck threw in his way.

Some time early in 1543—where, we do not know—Rodrigo de Cervantes married Leonor de Cortinas, daughter of Elvira de Cortinas. We know nothing of the family of Elvira de Cortinas except that she owned a piece of land at Arganda. Rodrigo de Cervantes and Leonor de Cortinas had seven children: Andres, Andrea, Loisa, Miguel, Rodrigo, Magdalena and Juan.

Miguel de Cervantes Saavedra was baptized on Sunday, October 9, 1547, in the parish church of St. Mary the Greater at Alcalá de Henares. We also have his personal testimony, given in 1590, that he was born in that city. The date of his

birth is not known—for it was not the custom to record this date in Spain at this time. From the fact that Cervantes received the Christian name of Miguel it has been conjectured that he was born on the Feast of St. Michael, Thursday, September 29, 1547. We have no information whatever as to how or where he passed his boyhood. There is a tradition that Cervantes matriculated at the university of his native town, Alcalá de Henares, at that time a famous institution of learning. But Cervantes' father was certainly not in a position to send his son to a university. A poor, unsuccessful man, he wandered from place to place in search of patients to cup and bleed. We can trace him from Alcalá to Valladolid, from Valladolid to Madrid and from Madrid to Seville. In October, 1564, we find him at Seville, where he seems to have owned a house. From the testimony of two witnesses living at Madrid, who in December, 1569, deposed to having known the Cervantes family for eight years, it is presumed that the family made their home in Madrid. Cervantes can have had little or no formal schooling: too poor to attend the university of his native town, "his originality developed untrammeled by dead scholastic tradition or academic routine." Cervantes' education was such mainly as he picked up in the school of practical experience. He knew some Latin and in his youth he managed to make acquaintance with some of the chief works in Spanish literature. It is evident that the man who wrote "Don Quixote" must have read the books of chivalry; and he must have read them with great care, for he refers to them frequently in after years in a manner which shows an intimate knowledge of them, especially with Amadis of Gaul, "that history as long as it is faithful."

With exception of a juvenile composition—a sonnet to Isabel of Valois, Philip II's third wife, written in 1568 and discovered only a few years ago, we hear nothing of Cervantes from the day of his baptism till he appears with some verses on the death of this same queen on October 3, 1568. These verses (a copla, four redondillas and a sonnet) were published by Juan

Lopez de Hoyos, a Madrid schoolmaster, who calls Cervantes his beloved pupil, "*mi amado discipulo.*" At this time, 1568–69, Cervantes was twenty-one—too old to be at school. Does this statement refer to the past? The fact that Lopez de Hoyos did not become headmaster of the school till January of the same year (1568) does not help to clear the matter. As the elegy that Cervantes wrote is stated to have been made in the name of the whole school, Cervantes may have had some professional connection with the school, as a tutor or some other official. This year, 1568, is an important one in the career of Cervantes. After his début as a poet, he disappears once more—and, apparently, disappears from Spain. We next hear of him in Rome. How, why or when he went there we do not know. Years afterwards (in the dedication of *La Galatea*, 1585) he tells us that he had served Cardinal Acquaviva as his *camarero* (his valet, probably) at Rome.

Giulio Acquaviva (not then a cardinal) was sent on a mission to Spain by Pius V, and reached Madrid on October 13, 1568, leaving on December 2d of the same year. How Acquaviva came to hear of Cervantes is matter of conjecture. It is supposed that it was through Lopez de Hoyos, who is presumed to have been in favor with Cardinal Espinosa, and that he interested the latter in the young Cervantes. The earliest documentary evidence that we possess concerning Cervantes in Rome is dated December 22, 1569, and from this it follows that he had been there for some little time, as it describes him as living at Rome.

From a declaration made by Cervantes' father in 1578, during the son's captivity in Algiers, we are told that Cervantes had been serving the king as a soldier for ten years—*i. e.*, that the son had been a soldier since 1568. If this be true, we are even more at sea concerning the period of his service as *camarero* to Cardinal Acquaviva. Whenever it may have been, Cervantes used his experience in the cardinal's household to good purpose. It provided him with a store of material which he utilized in creating Don Quixote's lively parish priest, the

learned canon who discussed the principles of dramaturgy ("Don Quixote," Part I, Chap. XLVIII) and divers other clerics.

There is no evidence at hand to show that he enlisted before the autumn of 1570. This is the testimony of Mateo de Santisteban, who deposed that he had been at Lepanto with Cervantes and that the latter had served in Diego de Urbina's company a year earlier.

Diego de Urbina's company formed part of the regiment of Miguel de Moncada. This is the Urbina whom Cervantes many years afterward, in the Captive's story in "Don Quixote," calls "a famous captain of Guadalajara." There are, however, chronological difficulties at this point which future investigations may perhaps resolve, but which it were needless to discuss here.

In 1570 the Sultan of Turkey, Selim II, made a peremptory demand on the Venetian Republic to surrender the island of Cyprus. And these demands having been rejected, the question could only be settled by force of arms. Venice naturally sought allies—she gained first the Pope, Pius V, then Philip II of Spain. Both sides were now preparing for the struggle. We need not go into detail concerning the petty bickerings of the allies, which, in fact, never entirely ceased during the whole campaign; nor need we more than mention the terrible tale of the siege by the Turks of Famagosta, on the island of Cyprus. Mark Antonio Colonna failed to relieve the town, which finally surrendered upon terms highly favorable to the garrison, who had made a gallant resistance for eleven months. Of course, the Turk never had any intention to respect the terms of surrender. The heroic Baglione and his chief officers were hacked to pieces by the Turkish janissaries, but a much more horrible fate was reserved for the gallant Bragadino. After having his ears and nose cut off he was flayed alive and his skin, stuffed with straw, was swung up to the yard-arm of the Turkish pasha's galiot. This was the enemy the League was to meet. Passing over the intervening events, we come to the battle of Lepanto—for here it is that we next hear of Cervantes.

The chief command of the three hundred galleons of the

League was given to Philip II's half-brother, Don John of Austria—the son of Charles V and Margaret Blomberg; the right wing being under Barbarigo, the left under Doria. On September 15 and 16, 1571, the combined armada of the League sailed from Messina under the command of Don John. Cervantes embarked on the *Marquesa*, commanded by Sancto Pietro—one of the ships of Giovanni Andrea Doria's division.

On Sunday morning, October 7th, at sunrise, while the armada lay off the Curzolarian Islands, the lookout on the *Real*, Don John's flagship, sighted the Turkish fleet. The battle was delayed some hours by adverse winds, and the signal to begin the battle was not given by the flagship till shortly after noon. When the conflict began Cervantes was lying below decks ill with fever, and we have the testimony of two of his comrades that he was requested to remain below. To their appeals Cervantes answered that death in the service of God and his king was preferable to remaining below. And we know that the *Marquesa*, in which Cervantes fought, was in the thickest of the fight.

His captain must have had a high estimate of his bravery, for Cervantes was given command of a long boat containing twelve men. When the fight was over and the Turkish fleet was scattered and in great part destroyed, Cervantes, it was found, had received two severe gunshot wounds in the breast and one in the left hand, which maimed him for life. It has sometimes been said that Cervantes lost his left hand—that it was amputated, and he is sometimes so represented in portraits. This, however, is by no means certain. It is true that in his own testimony long afterward, in 1590, he says that he lost a hand (*perdió una mano*) at Lepanto, but his father in 1578 says that his son's left hand was maimed (*estropeada la mano hizquierda*), and Cervantes in the "Viage del Parnaso" says that he "lost the movement of the left hand for the glory of the right." Moreover, it is not probable that a common soldier with only one arm would have been re-enlisted.

After a period of nearly 350 years it is impossible to under-

stand what was the effect produced upon the contemporary world by this naval battle. To Cervantes and the men of the sixteenth century Lepanto was what Salamis was to the Greeks —the greatest achievement of all history. And there is nothing in his whole career to which Cervantes recurs so frequently or which he recites so complacently as the part he took at the great *batalla naval*. To him this battle saved the world. "To have been there was for him in some sort an assurance of immortality." Nearly half a century afterward, in the prologue to the second part of "Don Quixote," when taunted by the scurrilous Avellaneda, who had just brought out a spurious second part of "Don Quixote," Cervantes says, "What I cannot bear resenting is that he upbraids me with my age, and with having lost my hand; as if it were in my power to have hindered time from passing over my head or as if my maim had been got in some drunken quarrel at a tavern and not on the grandest occasion the past or present has seen, or the future can hope to see. If my wounds have no beauty to the beholder's eye, they are, at least, honorable in the estimation of those who know where they were received; for the soldier shows to greater advantage dead in battle than alive in flight; and so strongly is this my feeling, that if it were now proposed to perform an impossibility for me, I would rather have had my share in that mighty action, than be free from my wounds this minute without having been present at it. The wounds the soldier shows on his face and breast are stars that direct others to the heaven of honor and ambition of merited praise."

It is said that when the news of the victory at Lepanto reached the Pope, he exclaimed, "*Fuit homo missus a deo cui nomen erat Johannes.*" The event was celebrated by poets and painters as one of the greatest in the history of the world.

The victorious fleet under Don John of Austria returned to Messina. Here Cervantes was in hospital for seven months, and did not again rejoin the colors till April 29, 1572, having received in the meanwhile some increase in pay. Now, however, we find him serving in the company of Manuel Ponce de Leon

in the famous *tercio* of Lope de Figueroa—whom Calderon brought upon the stage in his comedia *El Alcalde de Zalamea*. Cervantes was at first stationed at Naples—to the delightful life of which city he frequently alludes afterwards in his writings.

Cervantes' brother Rodrigo had also enlisted, when, we do not know, but it has been supposed that he arrived in Italy before June, 1572. Both brothers were in Naples shortly afterwards and both took part in the expedition to Corfu, were present at the fiasco of Navarino and at the capture of Tunis in 1573 (October 8–10) under Don John of Austria. We know that Cervantes was quartered at Naples in February and March, 1573, and again in February and March, 1574. Meanwhile he had done garrison duty with his regiment in Genoa. The chronology again here is perplexing, but Cervantes' writings prove that he knew Genoa and must have been there.

In 1574 Cervantes and his brother Rodrigo formed part of the expedition organized by Don John to relieve the Goletta (the citadel of Tunis). The expedition was too late and Tunis fell on September 13th, while Don John's fleet was still at Trapani on October 3d. We now find Cervantes doing garrison duty at Palermo under the Duke of Sessa and Terranova, the Viceroy of Italy. Here Cervantes remained ten months. His prospects had not improved, he had now been a soldier for five years—and although a *soldado aventajado*, he could not attain the rank of captain till he had been a *soldado aventajado* for ten years. He had not even reached the rank of ensign or *alférez*—so he determined to return to Spain to seek preferment. He had succeeded in getting letters from his chief commanders—from Don John of Austria and from the Duke of Sessa commending him to the king for a captaincy in one of the regiments then forming for service in Italy. Having obtained leave of absence, on September 20, 1575, he and his brother Rodrigo left Naples on board the *Sol*, a galley commanded by Gaspar Pedro, forming part of the flotilla under Sandro de Leiva. On September 26th the *Sol*, having become separated from the rest of the squadron, was attacked off *Les Saintes Maries* by three Turkish

galleys under the command of an Albanian renegade. While it appears that the *Sol* was not captured, its captain and a number of the crew were killed in the desperate fight which ensued, but the vessel was saved by the timely arrival of Leiva, though not till most of the crew were captured.

Cervantes and his brother Rodrigo were carried off to Algiers, where they became the slaves of Dali Mami, a lame Greek renegade. For the present, Cervantes' fighting days were over. He was now twenty-eight years old—some of the best years of his youth lay behind him. He had served as a soldier for five years; had fought valiantly for his king in several campaigns, was a cripple and, worst of all, was still a common soldier. A new hope had dawned for him, and with that sanguine temperament which never failed him, we may well believe that he stepped aboard the *Sol* with an earnest belief that his ambition was about to be realized—that he would soon obtain the captaincy to which he had looked forward, when suddenly all these dreams faded, and with that irony of fate which persistently pursued him through life, he was led into captivity.

We cannot dwell long upon his life as a slave in Algiers, though this period is one of fascinating interest, and though here the sober truth almost surpasses the wildest flights of fancy, and we should declare the stories related of Cervantes at once as utterly unworthy of belief were they not supported by irrefutable evidence.

Cervantes' first master was the Greek renegade Dali Mami, called *el cojo* (the lame). He relates his own experiences in the Captive's story in "Don Quixote," Cap. 39–42, as follows: "Every day he hanged a man, impaled one, sliced off the ears of another; and this with such slight provocation or so utterly without provocation, that the Turks admitted he did it simply for the sake of doing it, and because nature made him murderously inclined to all the race of man. One alone fared well with him—a Spanish soldier—something or other Saavedra by name, *un soldado español llamado tal de Saavedra*, to whom he himself

never gave a blow, nor ordered a blow to be given, nor said a harsh word, though he had done deeds that will live for many years in the memory of those people, and all to regain his liberty; and for the least of the many things he did we all feared that he would be impaled and more than once he feared it himself; and if time only allowed, I could tell you somewhat of that soldier's deeds which would interest and amaze you far more than the relations of my own story."

It is needless to say that the captive's story in "Don Quixote" is not the story of Cervantes himself, but it is colored throughout with his own personal experiences and he relates it in the first person.

When Cervantes was searched by his captors the letters of Don John and the Duke of Sessa were found on him. Naturally he was at once considered as a prize of great importance and a correspondingly high ransom was set on his head. He was also at first kept in very close confinement, and as he was physically incapacitated from doing hard manual labor, he was handcuffed, put in chains and shut up in the *Baño del Rey*, where the more important prisoners were kept. This first severity was evidently much relaxed afterwards. Cervantes made at least four attempts to escape and in each case he was the ringleader. The first attempt was in the spring of 1576. A Moor was bribed to guide Cervantes and some fellow prisoners on foot to Oran, the nearest point occupied by the Spaniards. It was a dismal failure. Their Moorish guide deserted them and they were compelled to return, and as a result Cervantes was again put in chains and more carefully guarded. In the meantime Cervantes' family—poor as they were—were making every attempt to ransom the two sons, and by the summer of the following year had gathered enough to ransom Cervantes' younger brother Rodrigo, who left for Spain on August 24, 1577, to carry out another plan of escape which had been conceived by Cervantes. By means of letters which he bore from two captive knights of St. John, an armed frigate was to be obtained from the Viceroys of Majorca, Valencia and Ibiza.

Preparations for this escape seem to have been made with great care and secrecy. Having gained the confidence of the Navarrese gardener of the Dey of Algiers, the prisoners began to dig a cave in this garden, which was situated about three miles from Algiers, and had constructed a hiding place sufficiently large to secrete fourteen men, food being brought to them by a renegade known as *El Dorador*. Some of the men had been in this cave for six months, when on September 28th, the expected frigate arrived. On September 20th Cervantes had succeeded in getting out of the town and everything promised success. As the frigate was approaching the beach, however, it was noticed by some passing Moors, who gave the alarm, and the vessel again stood out to sea. The frigate returned on September 30th, but in the meanwhile the scheme had been betrayed by *El Dorador*. Some of those on the vessel had actually succeeded in landing, but they were surrounded by Turkish horsemen and all in the cave, together with those who had landed, were captured. Cervantes took all the blame upon himself, declaring that he had done all the planning and was alone responsible. He was bound and led into the presence of Hassan, and though threatened with torture, he obstinately adhered to his first statement. His life was spared, and we are told that he was now purchased by Hassan himself and kept in strict confinement. The Navarrese gardener was hung up by one foot and thus suffocated. Nothing daunted, Cervantes in March, 1578, attempted to send a letter to Oran by a friendly Moor. The messenger was at the very gates of Oran when he was seized and searched; the incriminating letter was found on him, and he was brought back to Hassan, who ordered him impaled.

Another attempt to escape was made in September, 1579—and this time it was on the eve of succeeding when the plan was made known to the authorities by a Dominican monk, Juan Blanco de Paz. For this perfidy we are told the Dominican monk was rewarded with a gold *escudo* and a pot of butter. During all this time the family of Cervantes were making every

effort—scraping together every *maravedi* to release their son from slavery, and in truth Cervantes' trials were approaching the end. Cervantes' mother (who had represented herself as a widow) and his sister Andrea had collected 300 ducats. These were handed over to Antonio de la Bella and Juan Gil, two Trinitarian monks, who landed in Algiers on May 29, 1580, and began negotiations for ransoming prisoners. But 500 *escudos* were asked for the release of Cervantes, and all that they could raise was not much more than half this sum. The Trinitarians were especially anxious to redeem as many of Hassan's slaves as possible, as his term as Dey was soon to expire and he would leave for Constantinople, taking his prisoners with him. The 500 *escudos* were finally paid for Cervantes and he was set free. On October 24th he embarked for Spain. By December 18, 1580, he was again in Madrid.

Cervantes was now nearly thirty-four years old—he found Spain overrun with discharged soldiers like himself. He had to do something for a living, and like all men who can write, for want of anything more lucrative, he now turned to literature. He made acquaintance with some of the authors in Madrid, wrote laudatory sonnets for several works and gained some reputation as a facile versifier. He now turned to the stage, and, as he tells us, wrote twenty or thirty plays that were well received. Cervantes' friend, Galvez de Montalvo, having written a Pastoral Romance, he thought he would try his hand at it. He was a man of a sanguine, hopeful nature—he had no doubt he should succeed, and that here lay his fame and perhaps his fortune. At this period—he was now nearly forty—he married Catalina de Palacios Salazar—a girl of nineteen—the daughter of a widow who had a small estate at Esquivias, a little town near Toledo. This marriage took place on December 12, 1584. Speaking of this event, Mr. Fitzmaurice-Kelly, Cervantes' latest biographer, says:

"Possibly his friends thought him a fortunate man; evidently he shared this view. We cannot tell how far it was correct, for we know next to nothing of Cervantes' married life. There

are signs that he was not highly esteemed by some members of his wife's family; but this is the common lot of husbands."

In the spring of 1585 *La Galatea* appeared at Alcalá de Henares. For this he received from Blas de Robles, the printer, 1,336 reales—about $150—or about $750 nowadays. With this they set up housekeeping in Madrid and Cervantes once more resumed writing for the stage. He tells us that between 1582 and 1587 he wrote between twenty and thirty plays. But they never brought him much money. On March 5, 1585, he agreed to furnish Gaspar de Porras with two plays, *La Confusa* and *El Trato de Constantinopla*, for twenty ducats each. He had tried literature and it was a failure. As Fitzmaurice-Kelly says, "He was learning that as a means of livelihood the pen is even feebler than the sword. It was a lesson that he learned slowly and unwillingly." He was in difficulties and looked about him for permanent employment, which he found as commissary for the invincible armada which was now fitting out.

We cannot follow Cervantes for the next six or seven years, during which he collected stores for the armada and afterwards was a tax collector. The looseness with which he kept his accounts and his improvidence in entrusting treasury funds to a fraudulent agent got him into no end of trouble and also into jail a number of times. He was imprisoned in 1592 and again he was in Seville jail in 1597, but there being no charge of bad faith against him, he was speedily released.

Cervantes seems to have made Seville his headquarters in 1587–89, and there is documentary evidence that he lodged at an inn in the Calle Bayona kept by Thomas Gutierrez, who had formerly been a theatrical manager.

It should be observed that in 1590 (May) he petitioned the king for one of four posts then vacant in America (one in Guatemala and three in South America). The Council of the Indies rejected his appeal, Dr. Muñoz Morquecho endorsing upon it that the petitioner had better look about for something nearer home—"*busque por acá en que se le haga merced.*"

For some years Cervantes had now been engaged in an occupation which must have been most distasteful to him—getting into constant difficulties with the authorities on account of irregularities in his accounts, and once his sureties had to make good a deficit of some 27,000 *maravedis*—though no one supposes him to have been guilty of anything dishonorable. But he had to have bread. He now thought once more of writing for the stage. Ever since, as a boy, he had seen the strolling company of Lope de Rueda (the first manager of a professional theatrical company in Spain of whom we have any knowledge) —ever since that day the spell of the theatre was on him, and he never could quite shake it off. There is no doubt that he would rather have had the plaudits of the *mosqueteros* in the pit than be the author of the immortal Knight of La Mancha. In 1592 he agreed to furnish Rodrigo Osorio, a theatrical manager, with six plays, for which he was to receive no payment unless it should appear that one of the six plays could rank as one of the best ever put upon the Spanish stage.

We hear of Cervantes again 1594—again in hot water with his government accounts. All this time he had been receiving twelve reals and finally sixteen reals per day. On May 7, 1595, Cervantes won a prize in a poetical contest at Zargoza, but as it consisted of three silver spoons, it probably did not much improve his financial condition.

Meanwhile he had been writing occasional laudatory sonnets for various books of his friends, commending all sorts of works —from a collection of poems to a treatise on kidney disease. Finally, as a climax to his difficulties with the authorities, he was clapped into Seville jail in September, 1597. He was released, after serving about twelve weeks, on December 1st. None of his literary compositions except a sonnet on Herrera can be assigned to this year, unless we believe that he began his "Don Quixote" in Seville jail, as has often been stated. Cervantes seems to have touched bottom at this time. There is some evidence that he may have gone to Madrid in 1599 to arrange concerning the future of his natural daughter, Isabel de

Saavedra, who had up to this time lived with her mother, Ana Franca de Rojas, but there is nothing certain in his movements till May, 1602, when he is again at Seville. Two months later his brother Rodrigo, then an *alférez*, was killed in the *jornada de las Dunas*, *i. e.*, the battle of Nieuport, in the Netherlands; and in 1602 it is likely that he was once more imprisoned at Seville, though this is not absolutely established. In fact, after the summer of 1600, Cervantes disappears for a long time. Not till February, 1603, do we catch sight of him again, only to have impressed upon us more than ever the state of extreme poverty in which the family were living. His sister Andrea was now working as a seamstress and had made some underclothing for the Marquis of Villafranca, and the bill in which the various items are specified is still extant and is in the handwriting of the great immortal.

There is scarcely any doubt, however, that Cervantes was living in Valladolid, where the court then was, in the summer of 1604, and that the first part of his great masterpiece was then finished. The MS. had evidently been passed around among his friends, and Lope de Vega, then on unfriendly terms with him, speaks slightingly of the work and of its author in a letter of August 4, 1604.

The book was issued in January, 1605, by the printer Juan de la Cuesta in Madrid, and was immediately pirated by a Lisbon bookseller. It was a commercial success, but did not materially benefit the author. An event that occurred in Valladolid in June following, when "Don Quixote" was one of the most talked of books in Spain, is proof of this. Cervantes was then living with his wife and his daughter Isabel, his sisters Andrea and Magdalena and his niece Costanza in the Calle del Rastro, near the public slaughter houses, in one of the poorest quarters of Valladolid. A Navarrese knight, Gaspar de Ezpeleta, had been killed in a brawl at night near Cervantes' house, and having been carried into the house, died there. Cervantes, his daughter, his sister Andrea and his niece were put in jail. Cervantes was released on his own recognizance on July 1st,

three days after Ezpeleta died. We hear nothing of him during the latter part of 1605 or in 1606. In the latter year the court returned to Madrid. In fact, we know nothing of him till 1608, when we find him in Madrid. On March 1, 1609, his natural daughter Isabel, who must have been at least twenty-five years old, was married to one Luis de Molina. Cervantes was then residing in the Calle de la Magdalena. On April 19, 1609, he joined the newly founded Confraternity of Slaves of the Most Blessed Sacrament, and shortly afterward his wife and his sister Andrea received the habit of the Third Order of St. Francis.

In 1610 he wrote a sonnet on Diego Hurtado de Mendoza, a famous poet and patron of literature, then long dead, but whose poems were first published in this year. It was also in this year that Cervantes gained the favor of the Seventh Count of Lemos, who became his patron. Lope de Vega had once been the private secretary of the Count of Lemos, and when the latter was appointed Viceroy of Naples in the early summer of 1610 and took several literary men with him in his suite, Cervantes also hoped to be one of those chosen to accompany him, but herein he was disappointed, and he expresses his mortification in the *Viage del Parnaso*. In 1612 we find that friendly relations had once more been established between Cervantes and Lope de Vega, for both belonged to the *Academia Selvaje*, and Lope borrowed the cheap spectacles of Cervantes at one of the meetings and in a letter compares the glasses to badly poached eggs. Meanwhile Cervantes had been busy with his *Novelas exemplares*, which he dedicates to the Conde de Lemos, upon whom he was now a pensioner. The *Novelas* appeared in 1613, and from the prologue we learn that he had already finished his *Journey to Parnassus*, although this work did not appear till 1614. It was while he was engaged in writing the second part of "Don Quixote" that Cervantes heard of the spurious continuation of his own work that appeared at Tarragona in 1614. This apocryphal "Don Quixote" was written by Alonso Fernandez de Avellaneda, concerning whose identity there have

been many conjectures, but about whom we really know nothing. Avellaneda's second part was licensed on July 4, 1614. We do not know when Cervantes first saw it, but when it *did* come to his notice he was writing the fifty-ninth chapter of his own second part, for he there alluded to Avellaneda's continuation, which he stigmatizes as silly, *todo necio*. Avellaneda's book is not at all a bad one—it has one supreme merit—it urged Cervantes on, as nothing else could, to finish his own work. It caused him to work too rapidly, and the concluding chapters show signs of haste, but it is far better to have it so than to have it, perhaps, left to us unfinished. It was licensed on February 25, 1615. In the same year there appeared in Madrid eight comedies and eight interludes, "never before presented," some of which Cervantes may have written years before; in fact, he says that he found them in an old trunk. These plays could add nothing to his reputation. It is probable that the second part of "Don Quixote" appeared *after* the *Ocho Comedias*, and that it was the last of his works that he lived to see in print. In the prologue to his *Exemplary Novels* (1613) he had promised his *Persiles y Sigismunda*, a northern story, and likewise the *Semanas del Jardin*. This latter work, supposed by some to have been a devotional treatise, never appeared. The *Persiles* appeared posthumously in 1617. In the last year of his life he was dependent on the bounty of the Conde de Lemos and of Bernardo de Sandoval, Archbishop of Toledo. On April 2, 1616, he was professed as a Tertiary of St. Francis in his house in the Calle del Leon—being too ill to leave it. On April 18th he received extreme unction, and on the following day, with a supreme effort, he wrote the moving dedication of his *Persiles* and his work was done. He died on April 23, 1616, and was buried on the following day in the Convent of the Barefooted Trinitarians in the Calle de Cantarranas. His grave, like that of the great Lope de Vega, can no longer be identified.

I cannot end this brief sketch better than by quoting the words of Mr. Fitzmaurice-Kelly:

"Cervantes was no bloodless ascetic, no incarnation of dreary righteousness: we do him wrong if we present him in that crude, intolerable light. With some defects of character and with some lapses of conduct, he is a more interesting and more attractive personality than if he were—what perhaps no one has ever been—a bundle of almost impossible perfections. He was even as we are, but far nobler—braver, more resigned to disappointment, more patient with the folly which springs eternal in each of us. This inexhaustible sympathy, even more than his splendid genius, is the secret of his conquering charm. He is one of ourselves, only incomparably greater."

A TREE HUNT IN NORTH AFRICA

By J. Russell Smith
Professor of Industry, University of Pennsylvania

The Garden of Eden has been unduly monopolized by theologians or the irreverent. That mythical yet historic bit of earth has great lessons also for those who would nourish and sustain the human race. Trees made a paradise of Eden. A careful reading of the second chapter of Genesis will show that no vegetation is mentioned but trees, and that the expelled Adam was told to go out and dig in the earth, and grow herbs; in other words, practice the average agriculture of the plowed field by which we now too largely subsist.

Man lives by plants which furnish him his food either directly or by feeding the animals that give him meat, and in this dependence upon the plant world, we are using plants that have been picked out purely by chance. We have never had a systematic examination of the plant kingdom and the selection of the best. If we did, we would find that man's possibilities of food supply would be greatly multiplied, for there is no reason to think that the chance selection and improvements of the primitive past or the primitive peoples of the present have given us the best producing plants that the almost infinite variations of plant life afford.

A superficial view of our plant neighbors in their wild state leads us inevitably to the conclusion that trees are the great natural engines of food production. A wild walnut tree or a wild hickory or wild cherry will yield at times literally bushels of fruit, but as yet we make little use of crop trees. Most of them are entirely unimproved, and little is as yet being done to domesticate to the yoke of usefulness to humanity these greatest and longest lived of organisms.

This fact becomes peculiarly significant when we think of it

in connection with the recently discovered power of plant breeders, the making new combinations of qualities and new varieties. The work of Burbank, DeVries, Mendel, Spillman and others in this field of plant creation and its laws opens up to our contemplation vistas of greatly increased wealth for the human race.

The tree persists from year to year. It drives its roots deep into the earth. Because of this fact it has long been recognized as man's great servitor in holding the earth upon the mountain sides, but it can at the same time, if it is the right kind of a tree, make the mountain side productive in nuts, fruits and food for man and beast. Thus, by using rough land our productive area may be doubled. Similarly, its deep-rooted proclivities enable the tree to seek and find water better than our small grains. Thus the tree becomes the best crop for the dry farmer, and we have in this field also the possibility of wide extension of productive areas by utilizing lands that are now of little use with our present type of agriculture and the present crops.

These possibilities will doubtless appear to be much more nearly probable if we can find actual evidence of present production to make more real the theoretical conclusions which we can reasonably deduct from the working of known laws (plant breeding) on known raw material (the existing plants).

Bits of evidence showing the value to be derived from unused crop-yielding trees in America caused me to undertake a journey through the Mediterranean countries with the object of investigating the facts of tree-crop production in that region which has a much older agriculture, and one which has been claimed by O. F. Cook and others to have had its origin in tree crops rather than small grains which are our chief dependence in America.

The Berbers of North Algeria are a race that has been able to withstand the conquerors of North Africa for two millenniums. They are still living on their hills, the population clustered in villages and towns of stone houses always on the hill crest for easy defense. Many of these settlements are doubtless older

than Rome, whose legions, like those of Carthage, flowed around the hills of Kabelia but touched them not. Similarly Goths, Vandals and Turks have let the Berber alone. He only submitted to conquest before the rifles of the French in 1857. His sturdy courage has been able to keep his independence only through the aid of his mountainous country. He was always above his enemy in rough and rugged country where defense was easy and rewards of conquest light.

The valleys in this district are open and devoted to farms and pastures. The slopes for a space of a couple of thousand feet are tree-clad for miles and miles. It is in this tree zone that the people live. Above them are treeless pastures, below them the treeless valley, but the village-dotted slope is practically an open forest over large areas. Every tree in this forest is a fruit tree, chiefly fig and olive, with some carobs. Beneath the trees in the winter a little barley and wheat are grown. With this the Berber makes a loaf of coarse bread. The olive yields its oil, which is the substitute for our butter, cream and bacon. The dried fig, more nutritious than bread, is one of his great staples of diet. This does not sound like a very inviting diet, but with an occasional broiled joint, it has maintained a sturdy and vigorous race through a longer and more continuous history than any people of western Europe can trace. The carob tree, whose edible bean was called locust by those who described the sojourn of St. John the Baptist in the wilderness, furnishes a tid-bit occasionally eaten by the children, but mostly used to eke out the donkey's coarse fare of straw and scanty pasture.

As a measure of the efficiency of these tree crops in supporting mankind, it has been reported by Mr. Thomas Means, of the Department of Agriculture, that the Berber population is twenty times as dense where the tree crops prevail as it is on the same slope where the people depend upon grains and grasses of the ordinary agriculture—a rather surprising proof of the desirability of a tree-crop agriculture, especially for hilly countries.

In Central Tunis the remains of ancient Rome combine with

the practices of present agriculture to give a wonderful demonstration of the service that the tree can render to lands of little rain. Most of this region a short distance back from the seacoast is, in its economic relations, much like large areas of our great plains where the cowboy has reigned supreme since the buffalo gave way before the hunter's rifle. With a rainfall of twelve inches we have found in Texas, in Colorado and elsewhere that grain does not thrive. Only the pasturing animal can give us a scanty income from the land. In Central Tunis a similar rainfall produces a similar treeless, farmless pasture dotted here and there with the more picturesque and historic pastoral types, namely, the Bedouin with his camels, sheep, goats and the tents and bundles of portable goods which, with his flocks, constitute his entire fortune. As one rides southward from ancient Carthage through this monotonous landscape on the French railway, he sees far to the south of him as he approaches the town of Eldjem a great pile of masonry towering in the sky. It is the ruin of a coliseum rivaling that of Rome in size and almost a duplicate of it in plan. How did it happen that the Romans built such a coliseum in a camel pasture? The explanation seems to be included in one word, "olives." The French archæologists are agreed that over a large area reaching along the shores of the Mediterranean from Tripoli into eastern Algeria and in central Tunis from the sea clear across Tunis into Algeria there was, between the third and seventh centuries A. D., a vast olive forest covering millions of acres. This province paid as tribute to Rome ship-loads of the olive oil which has for three millenniums been so frequently and appreciatively referred to in the literature of the Mediterranean peoples. This vast coliseum at Eldjem was the recreation place of a city which was a metropolis of a land of olives as Pittsburgh is a metropolis of a land of coal and iron.

One hundred miles back from the sea is another equally interesting ancient city known as Suffetula, the present French railway station Sbeitla. Here the goats and camels browse beneath a well-preserved triumphal arch of the period of Con-

stantine. Near by are a ruined Roman theatre, ruined temples, early Christian churches and numerous private structures that adorned a city supposed to have held upwards of 50,000 people. This too was an oil metropolis, and ten miles back across the camel pasture I examined in detail a Roman oil village. In the center was one large ruined structure, and around it over a space of twenty acres were ruined oil mills still sufficiently preserved to show their structure—a round floor with a bottom slightly conical, highest in the middle, so that as the stone rolled around the olives would tend always to the outer edge to be crushed by the rolling stone, which, by the way, was found still lying in the grass hardby. Near the mill was always a press which had two upright pieces to hold the bars through which the screw passed to press the oil from the bags of crushed olives beneath the screw press. Stone gutters carry the oil from the press to stone cisterns about seven to ten feet square, some of them still capable of holding water. There is not now a tree within ten miles. On the way back to the station on the little phosphate railroad I passed numerous groups of Bedouins with their camels and donkeys, and examined the ruins of a number of Roman farms, on nearly every one of which I was able to find the old oil press with which through many a hot day the Roman colonial had toiled to make the product to send across the sea to imperial Rome. But as I looked at the ruins of the ancient prosperity and civilization, I stood in the presence of the destroyer—the Arab. Filled with the enthusiasm of Mohammed, he overran North Africa. Carrying with him his nomad's contempt for the sedentary man, he cut down the olive trees to make room for his flocks. He burned the cities and laid them waste, a condition which has prevailed unchanged since the eighth century.

But the Arab was too lazy to make his destruction complete. There are places where some of the ancient olive trees yet persist, fruitful, profitable trees planted by the Romans before 700 A. D., and still yielding crops, truly a wonderful example of the efficacy of the tree as a means of a man's support.

The olive is a deep-rooter where there is moisture to be sought below, a far-reaching rooter where there is moisture only on the surface. Its leaf is glazed above and hairy below, so that the water may not be given off. It is able to live and thrive on an amount of moisture which in America we have been unable to utilize for anything but the scantiest pasture. It is supposed that the legends of Roman cultivation persisted among the Arabs. At any rate, about 1840 they were practicing the dry farming which we have of late "discovered," with great success in the neighborhood of the city of Sfax, where olive orchards had spread inland several miles when the French took possession of the country in 1881. The French agriculturists soon realized the possibilities of this dry land olive culture, and there has been one of the greatest horticultural booms in the world in the reconstruction of the Roman olive orchards under French direction and Arab labor. In one place a lookout tower has been erected, and as far as the eye can see in all directions is one unending sea of black-green olive leaves, and yet the rainfall of the region varies from five to ten inches, with an average of about seven. It is so near the Sahara that the sirocco blows with burning fury, yet there is prosperity and the great boom with the rainfall so low that we in America have never tried to use it.

It affords great contrast to automobile through this district where the French, after their usual manner, have built excellent roads. For a few miles you will pass through the dry camel pasture with its thorny and sparse herbage of bushes and the occasional flocks of fat-tailed sheep, goats and camels and the camps of Bedouins. Then all of a sudden you will come upon 500 or 1,000 acres of young olive trees planted in rows that meet in the distant perspective.

The response of the Bedouin to this opportunity throws an interesting light upon the relation of environment to customs and ideals. Perhaps some persons think the Bedouin is a rover because of his nature; better say he is a rover because of the conditions under which he must make a living. Certain

parts of Tunis were set apart by the French in their treaty of 1881 to be left forever in possession of the tenting Arab, while others were to be taken by the French for settlement. The French are planting theirs to olives. The Bedouin has always had the privilege of planting a patch of barley whenever he saw fit, camping near until it was ready to harvest, thrashing out the scanty product and packing it in camel's hair sacks and loading it on camels to go where fancy or better pasture should dictate. But now, seeing the profit of olives, he reasons that if he can plant barley he can also plant olives, even though the barley does last six months and the olive lasts a thousand years. He is willing to wait twelve or fifteen years for the olives to make a profit. But the French regard this as a violation of the treaty which guaranteed that it should be kept for the tenting Arab indefinitely, so the *controleur civile* goes out and tears up the olive trees.

One hundred miles further on to the southwest, upon the very edge of the Sahara, is the region of Matmata, reported by the French to be the extreme case of the utilization of a harsh and forbidding arid environment by the agriculturist. So near is the region to the Sahara that the native avoids the blistering summer heat by building his house in the ground. As there is little rain, it is rarely damp, and he really has one of the most satisfactory houses, for it is far cooler than any structure above ground, and is also easily warmed when the chill nights of winter come. The town itself has 5,000 people, but as you look across it you see but two buildings, one the mosque, the other the little fort and headquarters for the French garrison. The 5,000 natives live in their holes in the ground. The houses consist of a court opening to the sky with doors leading off from the central court back into the subterranean rooms. The chickens, sheep and donkeys share this general abode, having their separate chambers leading off from the court, which is reached by an inclined passage.

The food supply is the barley loaf from a crop grown on the fields some eight or ten miles away on the edge of the plain.

The village itself is in a valley in the deeply eroded limestone hills. Across the water courses in these eroded hills the people have built rough stone dams which cause the floods of winter to pile up the eroded earth behind the dams. What little rain they do have comes in the winter, falls in torrents and much of it runs away. Thus the earth behind the stone dams gets thoroughly soaked in the winter season, and thus a rainfall of four or five or six inches suffices to keep olive trees and some date palms alive and fruitful. The number of crops that they yield is fifty per cent greater per decade than the number of crops of barley that can be had. Some of the men of the town are always away with the flocks, sometimes forty, fifty or sixty miles, but the deciding factor in the location of their homes and in the completion of their meager living is the wealth derived from the tree crops won by this unique method which might be duplicated in many arid lands in the United States and elsewhere.

The tremendous fruitfulness of the date oases of the Sahara makes this tree the greatest crop in all agriculture. It yields three to ten times as much food per acre as wheat, and it is known to have continued in some places without a break since Marius and Sulla strove for the possession of Roman provinces.

Thus North Africa alone gives convincing evidence in support of every division of my thesis—if properly developed and utilized, crop-yielding trees afford a means for the extension of the agricultural area into rough lands, into arid lands, and under some conditions they are the means for obtaining the greatest yield from level arable land.

One of the needs of the race is plant breeding to give us new varieties and cultural experiment to test their value and show how to use them.

SOME NEW IDEAS IN GOVERNMENT

By James T. Young

Professor of Public Administration, University of Pennsylvania

All authorities agree that American government is undergoing profound and important changes, that it is receiving the impress of new ideas of great potency for good or ill, and that the full import of these changes is just now dawning upon us. I shall consider some of the more interesting of these, which are grouped around three new principles:

The Concentration of Power rather than its dissipation.

Efficiency contrasted with impotence.

Government Usefulness and Service rather than Government Harmlessness.

Concentration of Power.—The first of these we have fought with main strength for over a century, yet concentration of authority is now the one great fact in our politics. All our political writers deplore it; all our magazines denounce it; all our newspaper editors preach against it; our entire public school system teaches that it is un-American and that it cannot be—yet concentration is the strongest single feature of our government today. Shall we still deny it or shall we accept it as a fact and use it? For many years the departments of our government have been steadily concentrating. In Congress there has long been a group of men, the chairmen of committees, whose word has been law as to which bills shall become law and which shall lie forgotten in the pigeon-holes of the committee room. When the Cannon despotism reached its height and a general reaction against the "one-man power" set in, many thought that this was the end of legislative concentration. But it was only a change in form. Today the Committee on Committees and the House caucus does the work formerly assigned to the speaker. But the greatest concentration has taken place

in that part of our government where we have striven hardest to prevent it—the Presidency. If there was one point on which the fathers of our government were fully agreed, it was that there should be no real power in the President to usurp the authority of Congress and to play the rôle of dictator in national affairs. Yet, by the force of circumstances, the President, no matter what his personal ideas might be, has been pushed into a position of leadership until he is now the strongest single influence in our whole system. Some still think that his control over Congress is purely a question of personality—an aggressive President, they say, will naturally influence more measures. But concentration has become far more than a matter of personality; it is now a strong, basic part of our political system. If it were merely personal, it would change with the changing personalities of our Presidents. But has it? Col. Roosevelt showed some of the possibilities of the new system, but people said it was due to Roosevelt. The real test came with President Taft. He was known to entertain the most conservative views of the legislative function, believing that it belonged to Congress alone. His judicial training and habit of mind, his temperament and inclination, all pointed to an old-time administration on conventional lines, in which Congress would make the laws and the President enforce them. But, confronted at the close of his first year in office by a long session of Congress, in which nothing had yet been done, he cast tradition, judicial habit and personal preference to the winds, and in the memorable closing month of the session of 1909–10, he forced through every important measure, save one, that he had recommended in his annual message. No such array of "inspired" or dictated legislation had ever issued from the halls of Congress as that passed in June, 1910. And it is significant that the President carried out his program because it was based upon a strong public opinion. Every law so passed had been a party issue in the previous election. Executive leadership does not mean an arbitrary use of the "one-man power;" but, rather the President's determined insistence on the passage of popular bills.

Concentration of power involves the selection of certain measures which are essential and a steady pressure upon these until they become law. If the official record of the President who has become a professor is convincing, how much more so is that of the professor who has just become President! Dr. Woodrow Wilson, in his valuable work on Congressional Government, published in 1884, speaking of the attempt of the fathers to balance the various branches of the government so accurately that no one could overcome the other, points out that the fathers' plans have failed and says: "The balances of the Constitution are for the most part only ideal. For all practical purposes the national government is supreme . . . and Congress predominant over its so-called co-ordinate branches."

Again, "The central government is constantly becoming stronger and more active, and Congress is establishing itself as the one sovereign authority in that government."

Yet again, speaking of the supreme influence of Congress over the Presidency and of "the declining prestige of the Presidential office," Dr. Wilson says: "That high office has fallen from its first estate of dignity because its power has waned; and its power has waned because the power of Congress has become predominant." In brief, Professor Wilson most emphatically (and rightly) pronounced our government of twenty years ago, a system of Congressional supremacy.

But President Wilson has shown no respect whatever for this same doctrine of "Congressional Supremacy." Like his immediate predecessors, he has plunged into the thick of legislation, he has kept Congress in session from Easter until Christmas, and has wrested from it a remarkable victory in the passage of the tax and currency laws. This is no mean feat for one who has so pointedly described the decadence of the executive and the complete supremacy of Congress in our federal government; it reminds us of that famous chapter in Ambassador Bryce's book, the "American Commonwealth"—"Why Strong Men are Not Chosen Presidents." Yet the truth is that both authors were literally accurate in every detail at the time

when their books appeared, for concentration and Presidential control are new ideas in our political system.*

The practical question, then, which faces us is: Shall we treat this new one-man power as a corruption of our government or as a strong, valuable and permanent development? Decidedly the latter. Executive supremacy is the salvation of democracy. No man who seriously investigates the causes of concentration can doubt its marvelous possibilities for the good of our people. The fact that we have steadfastly opposed it for 125 years must not prevent us from now accepting its benefits—as may be seen from a glance at the second new feature in our political system.

Efficiency.—It seems like a prank of political destiny that although our Constitution was built largely to prevent government action, we are now confronted by a new set of different but intensely practical conditions, viz.:

1. The growth in volume of government business.
2. The rise of technical questions in government.
3. A strong popular demand for greater speed in government action.
4. The large size and slowness of legislative bodies.

The Growth of Government Business.—All the private business changes of recent years, the inventions and discoveries of science, have seemingly conspired together to increase the work of our governing bodies. Each Congress today is overwhelmed by an avalanche of some 30,000 bills and resolutions. Any one who believes that 500 Congressmen and Senators can weigh, discuss and act on the merits of 30,000 measures, should pay an immediate visit to Washington and see the houses in action. The great increase in government affairs means that a radical change must be made in the old methods of work. This is the real cause of government concentration—to get work done.

The Technical Nature of Public Questions.—Most of the public questions of today cannot be settled by a popular vote. Who would like to see our voters deciding at an election the

* In the preface to his 15th edition many years later, Dr. Wilson clearly foresaw that the executive leadership must eventually change, if not destroy, the unquestioned supremacy of Congress.

details of a plan of regulation of corporations, or of the best methods of building the Isthmian Canal, or the planning of a system of irrigation? These all require the careful study of trained experts. They are not matters to be settled by simple common sense and patriotism. Unquestionably this is the underlying cause of further concentration of power. Congress can say—there shall be a canal from Panama to Colon, but the whole plan and its endless details must be worked out by the executive. Congress can say also—that we shall control the Philippines, Hawaii and Porto Rico, but the real government of those islands must, after all, be left to the President. The people at large may say—we shall have pure food laws, but the man who secures expert skill, who investigates, drafts and applies the principles of food regulation is the President or his department chief. In all these fields, not only the immense amount, but also the technical quality of the work to be done makes it impossible for any body of 500 men to perform the task. The President is distinctly the expert branch of the government. And so concentration proceeds for efficiency's sake.

The Demand for Quick Government.—Our political psychology is changing. We once loved a prolonged meditation and reflection on the most trivial political problems, because those problems served to stir the somewhat placid current of our rural life, but now we learn of these problems while in the midst of our own very pressing private questions and we ask, not for an opportunity to discuss them in detail, but rather that the government experts shall study them and shall present to us their conclusions in a predigested form, so that we may say "yes" or "no," and say it quickly. We are a nervous, impatient, hasty and sometimes hysterical people. Often we think wrong, in sudden spasms and gasps of emotion, oftener still we are right, but always we are quick. And this demand for a speedy government is only the result of our new psychology. Today we see, talk with, hear from and write to a hundred people, where our parents communicated with one. We transact business beyond

state and even national borders. We manufacture on a large scale with small profits, which means that we must spread out our operations over an immense area, in order to succeed. In all of this new set of conditions there is small place for that quality of slow meditation, that Fletcherizing of our political thought which many of us believe would be of great advantage. The demand for speed feeds on itself. Every year a larger proportion of human energy is devoted to the saving of time. Every year our conditions are breeding a quicker man with swifter mental processes, a more wonderful ability to see and grasp the opportunities of the moment, but with a corresponding intolerance of delay. Is it strange that this new type of man wants and will have a government that produces quick results? But quick government means a concentrated government. The control of all urgent matters must be placed in some central authority and within that authority the work must be so arranged that affairs can be despatched with the utmost celerity. Here again the purpose is to get the work done. In my judgment the speed idea has been somewhat overworked and we could secure the same results with more public discussion of measures, if we ruthlessly cut down the number of members in all our legislative bodies.

The greater size of modern legislatures has attracted notice throughout the country. Congress now has over 500 members, many of the state legislatures have grown beyond the possibility of debate and discussion. The general turning of the public mind toward city commission government, the proposal by Governor Hodges of Kansas, of a small commission form for that state, are only faint murmurs preliminary to a general demand for the complete reorganization of the national Congress. I assert that not one-fourth of our voters would approve the present form and size of Congress if they could personally see the methods by which that large, bulky and cumbersome body is obliged to transact the public business. It is most fortunate that our Presidents have taken the lead in legislation and have usurped for themselves the power of drafting legis-

lative programs and of forcing these programs through the Capitol. The keynote of their action has been efficiency, and until both houses are drastically reduced in size we must continue to depend upon Presidential usurpation to get the public work done.

Against the universal demand for efficiency are balanced the fears of the fathers, the general dislike of concentrated power, the traditional arguments against "centralization" and the natural conservatism of our people in political affairs. Efficiency has gradually turned the scale. We are fairly launched on our new career with a set of political institutions whose form is the same as of yore, but whose real substance is as different from that planned by the fathers as is the wireless telegraph from the "pony express."

The third group of new government ideas is that which I have clustered under the name of Service. We have always thought of government as a necessary evil. We have been patriotic, we have fought, bled and died for our native land, but for the government itself we have always cherished the half-concealed feeling that the less it attempted, the better. Our grand old Constitution itself is always referred to on the Fourth of July as the "palladium of our liberties," which in plain English means that it keeps the government from abusing us. That curious, persistent idea—that the government must always be kept from doing something which it is about to perpetrate—is now on the eve of disappearance, and we are developing in its place a new thought that the government is to perform a great and increasing amount of public service for the whole people. Government is now to be a means to an end, not the end itself. We are no longer, in the words of a prominent New Yorker, to believe that government is like the air, to be noticed only when it is bad. Hereafter, it is to be not a burden but a convenience. And what a marvelous vista of possibilities this new doctrine has already opened up in our national policy. Millions of acres of land have been reclaimed for cultivation by modern systems of drainage and irrigation. Hundreds of millions of dollars

worth of new crops have been added to our national wealth and prosperity by the Department of Agriculture. The people of hitherto unattainable regions of South America and Australia are to be brought within the reach of the Atlantic seaboard by the greatest engineering feat of modern times. And in the state governments the new idea is taking root no less rapidly and with amazing results. Hitherto unconquerable obstacles and problems of health and crime and poverty are now being attacked with the confidence and inspiration born of this new belief that the purpose of government is service. Occasionally there is a raucous cry of Socialism! Paternalism! and other "isms," but the American people have never been much interested in socialism and it is doubtful whether any of the new measures which are now being tried would gain or lose a single vote because they were or were not socialistic. A glance at some of these new undertakings shows the revolutionary change in our attitude toward government. The oldest calling in the history of man, farming, has always been regarded as a matter of individual capacity and intelligence—the government could do nothing to help; it could only distribute a few seeds before election time—but today both state and national authorities are seeing a new light; they are developing new crops; they are showing the farmer how to make the best use of his land; they are establishing or subsidizing agricultural colleges; and are now about to undertake a gigantic plan of farm teaching and demonstrations in the high schools of all the states; tons of literature are mailed free to the farmers every year, giving the results of the latest scientific thought. The greatest weakness in our agricultural system has been the inability of the farmers to co-operate with each other. Scattered over vast areas, separated from each other and lacking the ordinary means of getting together, they have been denied their full share in the advancement and knowledge of the community at large. This problem is now being attacked by state and nation in a way that promises nothing short of a revolution in the farmer's status. Trained scientists are at work investigating the possibilities

of co-operation, and the valuable results of the European and other co-operative movements are being brought to bear on our own conditions. Not least among these is to be the substantial improvement of agricultural credit, so that the rural business man may secure the same facilities for financing himself through his budget year as are enjoyed by his city brethren.

Let us take for our second example the service of the government to the mechanic and workingman. In his letters to a friend, one of our greatest earlier American statesmen said that, on the whole, manufacturing industry was to be avoided because it created hordes of working men and thereby led to turbulence and disorder. This view of the industrial worker as a necessary evil connected with manufacturing is now being abandoned and our governments are squarely facing the problem—what can be done to remove the cause of turbulence and discontent? We have already solved the problem in part by transforming factory conditions, rendering them more safe and healthful. We are now attacking the question of industrial accidents and enacting laws which will guarantee to an injured workman, regardless of whose fault caused the accident, a partial compensation, to be paid to him without legal quibbles, in regular instalments, immediately after he is disabled. In their new emphasis on public usefulness and service our governments are giving attention to three other aspects of the workingman's progress: the housing problem, the pension question and the increase of earning power by industrial training. Ten years ago, under its old conception of its responsibility, our government would have taken it for granted that the individual's welfare should depend exclusively upon his own efforts—a thrifty, industrious worker would be well trained, would save sufficient for a rainy day or an accident, would provide himself with a comfortable home and gradually but surely raise his own wages; any effort of the government to stimulate or aid his condition would be "paternalism." How far from this viewpoint our authorities have progressed may be judged from the fact that our more advanced commonwealths are now preparing

an elaborate system of industrial training in continuation schools; are investigating the possibilities, already shown in Europe and Australia, of renting or selling land in the suburbs to workmen, who may thereby not only win a more comfortable and attractive dwelling but also a small plot of ground in connection with it; and that some of the states are considering the possibility of an old age, accident and sickness pension system. To the cry of paternalism I can only answer that the laborer, like all the rest of us, must always depend upon his own exertions for success. But the new usefulness of government rests upon the new discovery that most of the barriers to success are not natural, but are man-made, and arise from those peculiar and unnecessary conditions of ignorance and bad environment which, having been created by society, may best be removed by government action.

Let us take as our last illustration that most popular subject of discussion, the cost of living. Here, we should all have agreed ten years ago, that our governments can do nothing and should attempt nothing. "Prices are fixed by the law of supply and demand." But once more the slow, steady, insistent march of the service idea is bringing us to a new thought of government usefulness. First, we have concluded the authorities can at least find out why the cost of living is rising. Experts in economic science have been put to work and have located these causes:

The increase of the gold supply.

The incredible and appalling waste in producing and distributing the necessaries of life.

The higher standard of living in comforts and conveniences.

Most of all, the frantic efforts of the consumer and his wife, Mrs. Consumer, to maintain what they call their "social status"—which in simple language apparently means the high scale of expenditures of their wealthiest acquaintances. For the moment the whole nation has given itself over to the universal demand for champagne and truffles.

But we ask, can the government do anything about all this?

Most emphatically, yes. The change to a normal, healthy mode of living and the abandonment of ape-like ostentation must come, when it comes, through the process of education. And here we have one of the highest and greatest services which our governments can perform. A study of family budgets and individual expenditures, if endowed in our schools and colleges today, would yield a return of 100 per cent in a single generation. We already have high school courses whose name is legion, teaching the young student how to husband, manage and direct the entire funds and resources of the nation. Shall we now turn his attention briefly to the management of his and especially her own pocketbook? Economic science can and does give us definite, helpful principles on the problem of the individual budget, yet millions of families are yearly confronting this problem with no benefit from the experience of others, and groping blindly about for their own solution. In every other field of human affairs the mistakes and successes of others have been collected, compiled, analyzed by the patient scientist and utilized by mankind. Yet in this one department which is fundamental in human happiness, viz., the use of our personal resources, a beginning is only now being made. May I again repeat that the state can undertake no greater service today than the education of its people on this basic question.

These few hasty illustrations may serve to show the far-reaching and profound importance of our new ideas of government. It is no longer something which collects taxes from us, allows us to vote, claims us for jury service, presses us into the army and offers us a never-ending subject of discussion in "political reform." It has become a positive, stimulating and helpful influence, aiding us to meet and solve many of our greatest problems, and is now beginning to exemplify that highest of human ideals, service. To many of our people, government activity is still a dangerous and fearsome thing, to others the thought that the government should serve or that we should look upon it as a convenience, is unpatriotic; but to me there

is something ennobling and uplifting in the new ideal, something which reminds us of that saying, "And he who would be greatest among you, let him be the Servant of all." Such are the new ideas in American Government—Concentration, Efficiency and Service, these three—and the greatest of these is Service.

THE SMOKE NUISANCE

By Robert H. Fernald

Whitney Professor of Dynamical Engineering, University of Pennsylvania

How and Why Smoke is Produced

Smoke is a result of imperfect or improper combustion. The Standard Dictionary states that smoke is the volatilized products of the combustion of an organic compound, as coal, wood, etc., charged with fine particles of carbon. Our ordinary conception of smoke is based upon the effect of these particles of carbon upon the eye, and we generally lose sight of the fact that, other than from an esthetic standpoint, more damage may result from the nearly colorless gases issuing from a chimney than from the more offensive black smoke. So pronounced is this color impression that the majority of ordinances relate specifically to the density of the smoke as determined by color charts. The universal standard is a system of charts known as the Ringelmann system, which, when placed at the proper distance from the observer, give graduations of gray between pure white and black, as indicated by the illustrations. A modification of the Ringelmann charts of somewhat more convenient form is also presented. Although the more harmful portions of smoke are practically colorless, it is nevertheless true that the color graduation may be an index of the efficiency of combustion and may indicate the proportion of injurious gases that are issuing from a given stack.

In order that the causes of smoke production may be clearly understood, it is essential that the conditions producing perfect and imperfect combustion be appreciated, as smoke is, as previously stated, a result of imperfect combustion. In the ordinary furnace under a steam boiler we find, as shown by the

slide, the grate upon which the fuel is placed; the openings in the grate through which air is supplied; the combustion chamber in which the oxygen of the air and the gases of combustion are thoroughly mixed; and the chimney or stack for producing the necessary draft and for carrying away the products of combustion.

For perfect combustion there are three primary requisites, namely, carbon, oxygen and a chemical combination of these elements. In the regular processes commercially employed the carbon is secured by the use of coal, wood, oil or other fuel; the oxygen is secured directly through an ample air supply; and the chemical combination of these elements is secured by maintaining sufficiently high temperatures. These processes of imperfect and perfect combustion as produced daily in thousands of power, lighting and heating plants, together with or without smoke production, are readily shown by the use of the simple, old-fashioned house lamp with which you are all familiar—the most perfect furnace ever invented.

An examination of this lamp will show, as indicated on the screen, the corresponding grate with its fuel bed; the holes around the hood, corresponding to the grate openings; the bulge in the chimney, acting as a combustion chamber; and the upper portion of the chimney, corresponding to the stack.

We will remove the chimney. At once a heavy smoke is produced. We have an ample fuel supply, the required flame temperature, but an insufficient air or oxygen supply, resulting in incomplete combustion as indicated by the smoke. This corresponds to the furnace working with insufficient draft, the hood of the lamp shutting off the proper air supply from the wick. Replacing the chimney upon the lamp, we observe the clear flame free from smoke. The temperature is seen to be high and combustion apparently complete. The chimney has increased the air supply by means of the natural draft produced and has also supplied the necessary combustion space for the mixing of the oxygen and the carbon from the fuel. It will be noticed that the wick can now be turned up considerably

without producing smoke and the size of the flame materially increased. As long as the oxygen supply is ample we get smokeless combustion, provided we do not increase the supply of air to such a point that the temperature is reduced below the critical point for the chemical combination of the carbon and oxygen. We will increase the fuel supply by turning up the wick until the draft produced by this chimney is insufficient to supply the air necessary to support complete combustion. We will now increase the chimney height and the smoke is at once stopped as the draft is now ample and we find that the wick can be turned considerably higher without exceeding the limits of proper air supply. Without changing the amount of fuel or the air supply, we will proceed to change the third essential factor, temperature, by chilling the flame by the introduction of a piece of iron. The expected smoke results, as the temperature is now too low to support chemical combustion of the oxygen and carbon. As the last illustration we will perform the operation corresponding to closing the ash-pit doors by winding a handkerchief about the base of the chimney, thus shutting off the air supply. Result, smoke.

Referring to the slide showing a typical boiler furnace, it is apparent that the hot gases leaving the fuel bed strike against the boiler tubes. These tubes are filled with relatively cold water and unless the conditions are correct for the fuel in use the flame temperature is chilled before complete combustion is established. The effects of thin fuel beds, excess air over the fire, producing low temperature, heavy firing with insufficient air supply, insufficient draft due to low or inefficient chimney, etc., may now be fully appreciated.

It is, apparent, I believe, that there are three factors that determine to what extent a boiler plant in commercial operation will smoke:

1. The character of the fuel used.
2. The character of the equipment used for burning the fuel.
3. The care exercised by the fireman.

It is obvious that the problem of smoke prevention is the problem of perfect combustion. Smoke once made cannot be burned. Smoke consumption is not possible and there is no such thing as a smoke consumer. As perfect combustion is possible, so smoke prevention is possible. This has been demonstrated on a small scale by means of the lamp and on a large commercial scale by such plants as the one shown on the screen. The black smoke which is regarded as so injurious and obnoxious is produced by the volatile hydrocarbons which are driven off when the fuel is heated. Bituminous coal, containing much larger proportions of hydrocarbons than anthracite, is a much greater offender as a smoke producer than anthracite. It should not be understood that absence of smoke means perfect combustion, as very imperfect and very inefficient combustion may be carried on without producing smoke, but this condition is too uneconomical to continue long without being detected by the financial management.

A very common erroneous impression exists regarding the amount of carbon or "good coal" that issues from chimneys in the form of smoke. Wild statements of enthusiasts on the subject of smoke prevention are frequently made to the effect that this carbon loss amounts to one-quarter or one-third of the fuel charged into the furnace. Such statements are absurd, as the amount of black carbon thus issuing probably seldom exceeds one per cent or possibly two at the most. Mr. William H. Booth, in writing on this point, says:

"It is customary to speak of smoke and the smoke nuisance as though black smoke were the only feature of imperfect combustion that demanded a remedy. But it cannot be too strongly emphasized that the visible impurities of the waste gases from factory chimneys are the least harmful part of their constituents; and that the invisible gases, which too often escape as the result of imperfect combustion, are far more detrimental in their effects upon vegetation and upon the health of the community. These invisible gases consist of unaltered hydrocarbons and of carbon monoxide; their presence is due

either to deficiency of air or to the lack of the requisite temperature in the combustion area. Smoke is the visible sign of the presence of these deleterious gases. It is, therefore, a useful signal of something wrong in the combustion process. Smoke ought to be attacked, not only because it brings dirt and depression in its train, but because its emission is accompanied by that of gases which are directly detrimental to the health of all living things, and at the same time carry away much heat from the plant of the fuel user. Both on humanitarian and economic grounds its suppression is called for."

This suppression can be secured through perfect combustion and it is not going too far to state that any fuel may be burned economically without smoke if it is mixed with the proper amount of air at a proper temperature.

Who Makes Smoke?

Owing to the fact that little definite information is available, relating to the smoke conditions of Philadelphia, it is necessary to turn to the reports from other communities for most of the data which I am about to present. The story is told of a young man who in reply to a query as to where he was born stated "Pittsburgh." The gentleman addressing him then asked, "When did you first see the light of day?" His reply was, "When I was nine years old when my family moved to Philadelphia." Needless to say, this reply was made several years ago, as the force of the reply would be largely lost in the atmosphere of Philadelphia today. Cities like Pittsburgh, Chicago, Cleveland and others of the bituminous coal belt have been forced to give serious consideration to this smoke problem and I have drawn freely from the reports of committees and investigators of these communities that we may better understand the true nature of the smoke problem that is seriously menacing the architectural and esthetic beauty of Philadelphia and the general health of the community. The significant slide upon the screen indicates the real smoke makers of Chicago

a few years ago before drastic measures were taken to "clean up the town."

(Slides showing other smoke makers.)

Although the proportions indicated for Chicago may not hold for this community, they suggest the various classes of possible offenders.

Smoke is made up of carbon, ash, tar, acids, ammonia and sometimes small amounts of arsenic. Recent reports from one city show the relation between industrial and domestic soot issuing from chimneys to be—

(Slide showing the following.)

	Industrial Plants, per cent.	Domestic Plants. Kitchen, per cent.	Dining Room, per cent.
Carbon	27.00	53.34	37.22
Hydrogen	1.68	3.68	3.51
Tar	1.14	12.46	40.38
Ash	61.80	17.80	4.94

It is readily seen that the amount of carbon and tar from domestic chimneys is relatively far greater than from industrial chimneys. It is also correspondingly apparent that the ash from domestic chimneys is relatively far less than from industrial chimneys. Domestic chimneys are seen, therefore, to have a record that is far from clear and must be taken into account in considering the ultimate solution of the smoke problem.

Effects of Smoke

Briefly, the effects of smoke may be summarized as:

1. Effect on buildings and building materials.
2. Effect on vegetation.
3. Effect on weather conditions.
4. Effect on health and conduct.

As previously stated, smoke contains considerable tar. This tar causes smoke to cling to buildings or to any material upon which it may lodge. Although much may be accom-

plished by washing, ordinarily a sand blast is required to properly clean buildings in the smoke-affected area. The contrast between the cleaned and uncleaned portions of smoke-stained buildings is apparent from the slides.

Smoke-stained buildings are not only offensive to the eye, but their life is often shortened by the action of the acids carried by the tar laden smoke. It is estimated that in Cleveland the sulphur contained in the coal burned amounts annually to 75,000 tons. The resulting sulphuric acid amounts to 230,000 tons, or 630 tons daily. The destructive effect of this agent is readily seen in buildings, draperies, libraries, dry goods, bridges, etc.

It has been found imperative to avoid the use of certain ordinary building materials because of the rapid deterioration due to the acids contained in smoke deposits. Some idea of the deterioration produced by the acids in the atmosphere is shown by the following table, which presents the results of a series of experiments on ordinary railroad rails as reported by Messrs. Worthington and Rattray:

	Loss in Weight in lbs. per yard per Average Year.	Number of Years of Observation.
1. In the center of the town	1.04	17
2. In dry place in smoky tunnel	1.48	13
3. In a wet place in same tunnel	1.71	8
4. On the seacoast among sand hills	0.18	17

House decorations are seriously affected by smoky deposits. The necessity of having the wall paper cleaned every few months may seem unusual to residents of the suburbs of Philadelphia, but unless our smoke is greatly reduced, it will not be long before Philadelphians will be forced to follow the example of her smoky sister cities. The life of draperies and other similar furnishings is materially shortened by frequent cleaning as well as by the action of acids in the smoke. The effects of smoke may readily be seen on down-town buildings in this city at the present time.

The action of smoke upon vegetation is confined largely to city areas. Its destructive influence is found in the trees of city parks. The leaves become coated with tarry deposits which shut out the sunlight and prevent the absorption of moisture. The acids contained in these tarry deposits tend to destroy the tissues, which results in the early withering of the leaves so conspicuous in smoky cities before summer is far advanced.

Smoke and the Weather

Dr. H. H. Kimball, of the Mellon Institute of Industrial Research, gives the following conclusions from an investigation of the relation between smoke and the weather:

1. City fogs are more persistent than country fogs, principally because of the increased density due to the smoke which accumulates in them.
2. In consequence of the fog prevalence there are fewer hours of sunshine in the city than in the country.
3. The sunshine is less intense than in the surrounding country.
4. Daylight, which often depends entirely upon diffused light from the sky, is depleted by smoke in greater proportion than direct sunlight.
5. Minimum temperatures are markedly higher in cities than in the country, in part, of course, because of city heating, but principally because the smoke acts as a blanket to prevent the escape of heat at night.

It is further found by chemical test that the intensity of the daylight is often two or three times as great ten miles from the center of a smoky city as at its center. An idea of the amount of soot floating in the atmosphere is shown by the soot fall of one city which ranges from over 700 to about 2,300 tons per square mile per year for the cleanest and dirtiest districts.

The relation between smoky atmospheric conditions and the health and comfort of the people in a smoke-laden community

is regarded by many as very direct, but the positive relation between smoke and disease is apparently not absolutely established.

Opinions vary greatly regarding this relation. Dr. William Charles White, in a paper before the International Congress of Hygiene and Demography, September, 1912, presents the very interesting charts shown on the screen to establish the relation between pneumonia, tuberculosis and smoke.

Some of his conclusions are:

"Having made an analytical study of the relation of smoke in the city of Pittsburgh, where it is possible by virtue of its contour to separate the atmosphere into 'densely laden,' 'moderately laden,' and 'comparatively no smoke areas' and in such a way as to rule out such influences as poverty, race, and congestion, we are forced to the conclusion that the smoke content of the air has an important bearing on the pneumonia death rate and comparatively little bearing on the tuberculosis death rate."

In commenting on the "terribly acute and fatal type of pneumonia" prevalent in Pittsburgh, Dr. White says it seems likely that there must be some factor present in Pittsburgh which does not operate in other cities.

"As we approach the subject we felt sure that we would be able to prove that this factor was the smoke of the iron and steel mills. (Slide showing smoke from steel mills.) How signally we have failed in this will be very evident from the chart in which is seen the striking contrast between Boston, with almost no smoke, and Pittsburgh, swamped with smoke, yet with approximately the same pneumonia death rate. The same sort of thing is apparent between Mobile, with almost no smoke, and St. Louis, with a very high smoke content in the air."

Dr. Ascher claims that smoke is responsible for a high mortality "from lung diseases other than tuberculosis," while Dr. Holman claims "that soot acts as a disinfectant." Dr. Day "finds that diseases of the nose and throat are not appreciably

more prevalent in smoky cities, but that they are more severe and harder to cure."

(Slide showing air breathed in smoky city.)

Dr. Littlejohn, of England, reporting to the Sheffield Board of Health, says, "That black smoke in itself, as a thing breathed, is prejudicial to health is even doubtful. Miners, who live in an atmosphere of carbon dust, are the next healthy class to farm laborers in the kingdom. When they die their lung tissues are found of an inky blackness, but Hirt, a great authority on vital statistics, thinks it in the highest degree probable that coal dust possesses the property of hindering the development of tuberculosis and of arresting its progress."

On the other hand, I find a statement to the effect that in a fortnight of heavy smoke-fog in London in 1886 the rate of mortality rose from 17 to 40 per thousand. The writer further states that this is not true with the fogs of Paris, where the fog is not of the heavy smoke variety. He states, however, that the invisible gases are the injurious portion of smoke and not the black carbon particles.

That the sun's power is greatly reduced by a smoky atmosphere has been proven in the smoke-laden districts of London, where it is found to be only about one-eighth as effective as in the rural districts. The table presented on the screen shows the average duration of bright sunshine for a period of twenty years for sections of London and the nearby towns of Kew and Cambridge.

The well-known London fog has been materially reduced since active measures have been taken to reduce the amount of smoke. It is reported that in the past thirty years the number of days of fog for the winter months has been so reduced that the days of bright sunshine have been practically doubled. Pittsburgh, on the other hand, with its increased use of bituminous coal, shows a record quite the reverse. From 1907 to 1911 the average number of days of fog reported per year amounted to nearly fifty, as compared with twenty-three for the previous period of five years.

Attempts have been made to trace nearly all the ills of man to the atmospheric conditions produced by the presence of smoke. Statistics have even been presented to show that suicidal tendencies and murders are directly traceable to smoke-laden atmospheres. Recent investigations, however, show that smoky, foggy England has a lower suicide percentage than other European countries. Dark, gloomy, smoky days undoubtedly lessen the productive effort, particularly if that effort be muscular. This is due largely to the fact that the poisonous gases given off from the body are not as readily dissipated as on clean, sunny days.

Dr. Wallin in commenting upon how the various smoke-induced weather states affect the mental and bodily health and happiness of human beings, cites many instances in which "literature, both poetry and prose, allude to the alleged effect of sunshine or the absence of sunshine on the feelings of man.

"Many writers cannot do satisfactory work unless the weather fits the mood, motive or scene; unfavorable weather states cause a disagreement in the thought processes.

"Southey refers to the depressing influence made upon him by the 'vile, dark, rainy clouds' of Great Britain, when he returned from a sojourn in sunny Italy, where his brain was in a state of high illumination. An Italian proverb runs thus: 'Where comes no sun the doctor comes.' Similarly, a German saw: 'The funeral coach turns twice as often on the shady side of the street as on the sunny side.' J. Ashby-Sterry has dwelt upon the demoralizing effect of the London fog:

A London fog when it arises
All London soon demoralizes.

It chokes our lungs,
Our heads feel queer,
We cannot see, we cannot hear.

So when this murky pall drops down,
Though dearly loving London town,
We feel we cannot quite revere
A London fog.

"Likewise, Walter E. Smith:

> A gray fog in the early prime,
> A blue fog by the breakfast hour,
> A saffron fog at luncheon time,
> At dinner a persistent shower
> Of smut, and then a dismal power
> Of choking darkness and despair,
> Thickening and saddening all the air."

Dr. Wallin further states that for "assault and battery, and drunkenness I have been unable to obtain statistics. I believe, however, that we are justified in concluding, from the rather meager facts in our possession, that the devitalizing weather conditions produced by manufacturing cities do not increase misdemeanors and crime. On the contrary, they seem to inhibit rather than incite offenses against the law. From the standpoint of the police courts, depleting days seem to be a desirable asset, while bright, tonic, irritating days are an undesirable asset. Granting the truth of this contention, let us not forget the complementary and more important facts presented in the preceding pages: namely, that gloomy, humid, foggy days (such days as are produced by smoke-begrimed skies) lessen vital potential, reduce or retard activity and impair efficiency, while bright, dry, sunshiny days increase the potential reserve, liberate energy, augment working capacity and stimulate ambition. To be sure, an unbroken series of sunny days might prove too stimulating, or at least too monotonous, but the elimination of city smoke will at the most only eliminate the frequent and oppressive smoke-induced weather clouds. Nature will furnish an ample supply of misty, cloudy and rainy days."

The Esthetic Side of the Smoke Nuisance

Cities have suffered seriously from the influence of smoke upon the beauty of buildings, the artistic effect of statuary and the freshness of landscape gardens. The character of the work done by the architect, sculptor, the gardener and the

decorator has all been modified by this agent and many invaluable paintings, books, manuscripts and fabrics have been ruined by the action of smoke.

Mr. Donnelly, chairman of the Chicago Smoke Commission, in an address before the Cleveland Chamber of Commerce, says, "What is the use of talking about a civic plan until you clean up the smoke question?"

Cost of Smoke

Most of the detailed information available relating to the estimated cost of the smoke nuisance is supplied by the Pittsburgh investigations.

The principal sources of financial loss chargeable to smoke are:

1. Painting and repairs to the exterior of buildings. Two firms in Pittsburgh estimate that annual bills for washing and painting their buildings are increased $700 and $500, respectively, by the action of smoke.

It is necessary to paint houses in Pittsburgh every three years, as against six years for those not in the smoke belt. The extra expense of exterior painting is estimated as $330,000 per year.

2. Redecorating interiors, cleaning and maintaining interior furnishings.

Pittsburgh's estimate is $910,000 annually.

3. Cleaning windows, building interiors, skylights, etc., twenty-five per cent of the cleaning expense in Pittsburgh office buildings is charged to smoke. For some buildings the annual cleaning expense amounts to $75,000.

The excess monthly cost for window cleaning in one building is estimated as $320 more than if the building were located in New York.

4. Injuries to goods in wholesale and retail stores and factories. In Pittsburgh the damage to goods runs into thousands, amounting to $30,000 annually in one store.

5. Increased bills for artificial illumination. Pittsburgh estimates this item at over $700,000 annually.

6. Bills for laundering, dry cleaning, etc. Pittsburgh pays not less than $1,500,000 more in laundry and home washing bills than it would were the smoke nuisance eliminated.

The extra cost of dry cleaning is estimated at $750,000.

7. Loss due to the depreciation of books, works of art, etc. This is a heavy loss, but difficult to estimate.

8. Loss due to imperfect combustion. The value of the coal used in the Pittsburgh territory in 1913 is placed at $20,000,000 and the loss due to imperfect combustion is stated as $4,340,000. Wilson estimates this loss for the United States at $90,000,000 annually.

The summary for the City of Pittsburgh is as follows:

1. Cost to the smoke-maker—	
Imperfect combustion	$1,520,740
2. Cost to the individual—	
Laundry bills	1,500,000
Dry cleaning bills	750,000
3. Cost to the household—	
Extra painting	330,000
Sheet metal work	1,008,000
Cleaning and renewing wall paper	550,000
Cleaning and renewing lace curtains	360,000
Artificial lighting	84,000
4. Cost to wholesale and retail stores—	
Merchandise	1,650,000
Extra precautions	450,000
Cleaning	750,000
Artificial lighting	650,000
Department stores	175,000
5. Cost to quasi-public buildings—	
Office buildings	90,000
Hotels	22,000
Hospitals	55,000
Total	$9,944,740

Numerous estimates of the per capita and total annual cost chargeable to smoke are offered by various writers on the subject. A summary of these is presented:

	Per Capita.	Total.
United States (Wilson) (in large cities)	$17	$500,000,000
London		26,000,000
Chicago	8	17,600,000
Pittsburgh (one estimate)	20	10,600,000
Pittsburgh (second estimate)	12	6,300,000
Cincinnati	20	8,000,000
Cleveland	10	6,000,000

Historical Data on Smoke Elimination

Discussion of the smoke nuisance is hardly new. Some 600 years ago King Edward I is reported to have made the use of "sea coal" a capital offense in response to a petition from the citizens against its use, so in 1273 we find a law prohibiting the use of coal in London. There is also a report that one John Doe was tried, condemned and executed in 1306 for burning coal in that city. Evidently these stringent regulations were later removed, as we find that during the reign of Elizabeth the people protested strongly against the use of coal. About 1660, John Evelyn ventured to publicly protest in his review called "Fumifugium" against the inroads of smoke. He presented an article on smoke prevention entitled "Fumifugation; or the Inconvenience of the Air and Smoke of London Dissipated, Together with Some Remedies Humbly Proposed by John Evelyn, London, 1661." One of his laments is that "Owing to the increase of coal smoke, the gardens no longer are fruitful."

In the United States in 1818 an old gentleman who visited Pittsburgh is reported to have written that even the complexion of the people was affected by smoke.

As early as 1856 we find in Cleveland an ordinance drawn to prohibit the use of soft coal in manufacturing plants, and in 1860 Pittsburgh got after the railroads with an ordinance which

states that "no bituminous coal or wood shall be used in the engine of any locomotive employed in conducting trains upon any railroad." The first general ordinances in this country were formulated in Chicago and Cincinnati about 1881, and today practically every city of over 200,000 inhabitants that uses bituminous coal has a smoke prevention ordinance.

An appreciation of Philadelphia's rapidly increasing smoke nuisance is apparently of recent origin, as reports of a discussion upon this subject at the Franklin Institute in 1897 show that one, William A. Ingham, states, "There is no smoke nuisance in Philadelphia. Our clear skies prove that."

Smoke and the Railroads

The suggested methods of smoke elimination from locomotives are:

1. Use of comparatively smokeless fuels.
2. Use of air jets.
3. Use of mechanical stokers.
4. Instruction of the men operating the locomotives and supervision of their work.
5. Elimination of the steam locomotive.

Elimination of smoke from locomotives is a live and vital problem with many railroads today. Contrary to popular belief, the railroads are giving this problem serious consideration, and have accomplished much within the past few years in the development of jets and mechanical stokers for smoke reduction and in securing reasonable returns from locomotive firemen in handling their engines in or near cities. The local conditions differ for different cities and the elimination of smoke from this source is far easier in one community than in another. Philadelphia is unfortunately so located that nearly all trains leaving Broad Street Station have a steady up-grade pull for several miles. The ingenuity of the fireman is put to the test if he succeeds without objectionable smoke, in starting his train from rest and in building up his fire to meet grade demands.

The Smoke Nuisance

An examination of a paper presented to the International Society for the Prevention of Smoke, by Mr. D. F. Crawford, general superintendent of Motive Power, Pennsylvania Lines west of Pittsburgh, leads me to interpret his conclusions as follows:

1. Use of comparatively smokeless fuels.

Anthracite coal, low volatile bituminous coal, coke and oil may be considered as comparatively smokeless fuels, although the inclusion of oil is somewhat doubtful. It is essentially imperative that a locomotive use the fuel of the region through which it passes. Although anthracite is found in Eastern Pennsylvania, even if the cost were not prohibitive, the entire output would not be sufficient to supply the demand for locomotives alone. Low volatile, bituminous coal is helpful, but is found at comparatively few points. Coke is needed for metallurgical purposes. The output could be increased, but this fuel is not adapted to locomotive use, as it materially reduces the capacity of the engine.

Oil is at present confined to its own localities for this service. The railroads of our locality are, therefore, practically forced to use bituminous coal, and it becomes incumbent upon them to conquer the smoke nuisance with the fuels available.*

2. Use of air jets.

There is a large number of designs of air jets that have been tried on locomotives. Tests have shown for locomotives in yard service and switching service that for the majority of the time they are in use the introduction of sufficient air to reduce smoke will not seriously decrease their capacity and will tend to improve the economy of coal consumption. One of the difficulties to be overcome is the noise. Many locomotives already equipped are being watched to determine the actual success of this device.

(Slides showing value of jets.)

* Within a few days I have learned of developments that indicate the possibility in locomotive service of using powdered fuel with high efficiency and economy and with freedom from smoke.

3. Use of mechanical stokers.

For nine years the Pennsylvania Lines west of Pittsburgh have been working to develop a mechanical stoker for locomotive use, and the results so far have been sufficiently satisfactory to warrant its application to a total of 300 locomotives, of which 215 are at work—66 in passenger, 130 in freight and 19 in switching service. These stokers are the most promising devices yet installed for the reduction of locomotive smoke from bituminous coal—"in fact," Mr. Crawford states, "under favorable conditions the smoke is practically eliminated." He finds that there is only from ten to thirty-three per cent as much smoke with the stokers as without. The volume of black smoke at the time of firing is also done away with. The test of two locomotives in service showed the hand-fired locomotive to emit seventy-five per cent smoke, as compared with eight per cent for the stoker-fired.

4. Instruction of men operating the locomotives and supervision of their work.

The cost of fuel amounts to some eight to ten per cent of the total operating cost of the railroad. Fuel economy is, therefore, one of the most direct ways of reduction in operating expense. This field is an extremely important one and at the present time much is being done in this direction.

5. Elimination of the steam locomotive.

This practically means the substitution of the electric locomotive. Complete electrification of the railways would eliminate at least twenty per cent of the smoke of our industrial centers. Electric power will be extended, but in Mr. Crawford's opinion, its use will, at least until there is great improvement in the efficiency, reliability and reduction of the cost of electrical apparatus and its operation, be confined to meeting special conditions, such as the operation of the lines through tunnels, and certain lines with exceedingly heavy grades and a large volume of traffic, as well as some terminal passenger stations

where the location and traffic conditions are such as to readily permit of its adoption.

(Slides showing electric and gas-electric locomotives.)

"The cost of everything electric is high. The cost of electric locomotives is at least double that of the steam locomotive which they are supposed to replace, and before electric locomotives can be operated it is necessary to incur large additional outlay for power house, transmission systems, track preparations and all of the other apparatus and material which is necessary to complete an electric system. As there are about 70,000 locomotives in the United States representing an investment of about $1,400,000,000, some exceptionally favorable return must be apparent before they will all be discarded."

In referring to this question of smoke from locomotives in his 1911 report, Mr. Bird says, "It is the conclusion of the Smoke Department that in Chicago fully one-half of the dirt caused by soft coal smoke comes from steam locomotives."

He further states that "The conclusion of this investigation is that the anti-smoke fight in Chicago has already succeeded in making a great reduction in the smoke made by steam railway locomotives. The proportion of this reduction is probably in about the ratio of from 41 per cent to 22 per cent. The lowest averages obtained by any road are in the neighborhood of 10 per cent. It is believed that 10 per cent is about the best that can be obtained by steam locomotives using Illinois or Indiana soft coal and the aim of the Smoke Department today is to bring all the roads to this figure. It has been shown that the railroads of Chicago are now making about 43 per cent of the total smoke of the city. This is with an average density of 22.3 per cent. If this average could be reduced to 10 per cent it would mean that the railroads would then be making about 29 per cent of the total smoke of the city. With steam locomotives this is about as well as can be done. This is the goal with this form of motive power and no further improvement can be made without abolishing the steam locomotive from the city."

Mr. Bird's report further states that the use of semi-bitumi-

nous coal would probably not reduce the smoke below the possible goal with Illinois coal. Coke increases sparks and cinders and the volume of the objectionable gases is not reduced by the use of anthracite or coke. Oil makes smoke unless carefully handled and the smoke is more objectionable than from coal. The use of any specially selected fuel is prohibitive in cost.

Mr. Willard Beahan, an engineer in whom I have great confidence, says, "I cannot agree to the proposition that, in general, electrification is now practicable on railroads through cities as a means of smoke prevention. The time has not yet come. We must not invest money in transportation methods not yet beyond the laboratory stage. We have done too much of that. We read that such an installation in New York City has paid 1.5 per cent on the investment. It is futile to propose, as engineers, what financiers cannot go into the money market and secure funds to carry out. You can't divorce engineering and finance in transportation matters today."

The Future

Several factors are working together to bring about a material reduction in the amount of smoke discharged into the atmosphere. Among these are:

1. Central station power and heating plants.
2. Use of gas, coke and anthracite for domestic purposes.
3. Future electrification of railroads.
4. The introduction of producer-gas power plants.

1. Central station power and heating plants.

There are several hundred central steam and hot-water heating stations in the United States serving both the business and residential sections of large communities. This business is rapidly increasing and has already assumed sufficient proportions to warrant the organization of a National District Heating Association. These installations are springing up rapidly throughout the Central States, where bituminous coal is largely in use. Such centralization leads to economy in fuel consump-

tion and to a material reduction of smoke. Although this has resulted in the elimination of many small, smoky steam plants, yet in districts in which heat cannot be secured from central stations, there still remain poorly operated, uneconomical heating plants, too small to warrant the use of mechanical stokers or special furnaces constructed to prevent smoke.

Central stations for power and lighting are springing up all over the country. Electric lights are now in general use in towns numbering their populations by hundreds. Electric transmission for street railway service is practically universal and electric power for shop drive is in great demand. The substitution of the electric locomotive for the steam locomotive for terminal service and even for line duty has received great impetus in the last few years.

These changes and developments in every section are tending to do away with the individual small steam equipment, whether stationary or locomotive, and are bringing to the front the central power station ranging in size from lighting and pumping plants of less than 100-horsepower in smaller towns to those of 100,000-horsepower or more required to meet metropolitan demands.

2. Use of gas, coke and anthracite for domestic purposes.

Although we like to think of the manufacturing plants and railroads as the chief offenders in the production of smoke, we cannot look this problem squarely in the face without admitting that in cities using bituminous coal the smoke issuing from the chimneys of residences and apartment houses is a considerable portion of the total. Investigation shows that "in domestic installations 6 per cent of the coal escapes through the chimneys. Weight for weight the coal burned in domestic installations is twelve times more a nuisance than that under power plant boilers." In most cities offenders in this particular field do not come within the range of the law.

The introduction of the by-product coke oven in this country will undoubtedly prove of material aid in supplying a reason-

ably priced domestic fuel practically free from smoke producing constituents.

3. Future electrification of railroads.

Although not much encouragement is thrown out for the immediate electrification of more than small and scattered portions of the railways of the country, yet the future prospects in this field are undoubtedly very promising. The transition must of necessity be a gradual one, but this transition is already under way and time and money only are needed to insure the realization of this great industrial development. Complete electrification of the railroads is bound to come in due time.

4. The introduction of producer-gas.

Through investigations conducted by the United States Bureau of Mines, under the direction of the writer, it has been demonstrated that the introduction of the producer-gas power plant is a factor of great importance in the interest of fuel conservation and smoke reduction. It has been shown that on the average there can be developed from a ton of coal used in the gas producer, two and a half times as much power as from the same amount of coal in the ordinary steam-power plant.

The great saving in fuel thus secured has led to the installation of several hundred producer-gas plants throughout the United States within the last decade. In the smaller installations anthracite coal is largely used, but bituminous coals, lignites and peats serve as the fuels in the larger installations. These producer plants are practically smokeless during their operating period. In certain types of installation operating under suitable conditions the fires need not be drawn for months and sometimes for years. In these cases it is no exaggeration to state that they are absolutely smokeless. As a smoke preventer the gas producer is one of the most efficient devices upon the market, and in addition, instead of reducing the fuel consumption 10 per cent, or even 15 per cent, as claimed for the ordinary smoke-preventing device offered in connection with steam

plants, the fuel consumption is reduced from 50 to 60 per cent by the introduction of the gas producer.

(Slides of producer-gas plants and gas-driven boats.)

It is well also to note that from an architectural standpoint the introduction of these plants also tends to eliminate unsightly chimneys, which, at the same time, results in a further financial economy.

It has also been demonstrated that such fuels as mine refuse, lignite and peat can be successfully utilized in these producer-gas plants, but the high ash content in the mine refuse and the high percentages of moisture in the lignites and peats make the cost of transportation prohibitive. The location of such plants directly at the mines will be the logical solution of the problem.

In the United States cheaper power is constantly sought. The water possibilities of the country are being realized and the hydro-electric power plant is a wholesome cause of competition. The supply of fuel of marketable grades is not unlimited. Prices for such fuel must necessarily increase. The cost of transporting coal from the mines is high and the possibility of obtaining a sufficient supply of cars to handle low-grade fuels is questionable. The power demands of the country are increasing and this power must be developed at a reasonable cost. Economic considerations point directly to the location of large producer-gas installations at the mines and the distribution of the energy developed either by high-voltage long-distance electrical transmission or by pipe systems for conveying the gas. Such installations tend positively toward smoke elimination.

With a large percentage of the small, isolated, smoking power and heating plants and steam locomotives removed from the larger cities of the country, and the remaining steam plants under proper supervision, the seriousness of the smoke situation ought to be very greatly reduced and as this development goes on, the atmosphere of our cities will become clearer and the heavy financial losses and unsightly conditions now directly traceable to smoke will be practically eliminated.

(Slide showing future possibilities.)

Real Smoke Abatement

As I have already indicated, attempts to regulate the smoke nuisance are not new. We have today the same problem that has been before the public for over six hundred years and we may well inquire:

1. Whether our methods of approaching this problem in the past have been productive of real and lasting improvement?
2. How shall we approach the problem to secure real smoke abatement?

The answer to the first query is, to my mind, simple. Many ordinances have been formulated and adopted. Many convictions have been secured and many fines have been paid, but in the majority of cases only the surface of the real problem has been touched and the root of the difficulty has been entirely neglected. One of the most serious drawbacks to the methods of procedure in most cities of the United States is the political aspect of the problem, and I desire to strongly emphasize my belief that until this issue is entirely divorced from all political affiliations and until public sentiment is strongly developed, little lasting progress will be made through legal procedure.

This has been recognized by one or two cities and attempts have been made to entirely differentiate the smoke prevention department from politics and to organize it on a sound engineering basis. Chicago has approached this problem far more logically and efficiently than any other city and the results of the Chicago plan have been most gratifying. The marked success of Mr. Paul Bird, who was for several years in charge of Chicago's Progressive Policy, is due in great measure to his clear appreciation of the many commercial considerations involved as is shown by a single abstract from his 1911 report:

"The advantages of this cheap fuel (bituminous coal), which means cheap power and heat, are obvious, and it is apparent that any attempt to abate the smoke nuisance by forcing the use of hard coal or even soft coal from another state, would be commercial folly."

With the single exception of Chicago, our methods of attacking the problem of smoke prevention have resulted in little real and lasting improvement.

How shall we approach the problem to secure real smoke abatement?

In answering this question let us remember:

That any fuel may be burned economically and without smoke if it is mixed with the proper amount of air at the proper temperature.

That the problem of smoke prevention is the problem of perfect combustion.

That the reason so many plants smoke is because they were built to generate steam and not to prevent smoke.

That furnaces and mechanical contrivances must be designed for and adapted to their work.

That the best mechanical device is of little value unless properly and intelligently operated.

That in a single locality each type of installation and variation in load demand presents a different engineering problem.

I am not altogether in sympathy with the idea that smokeless combustion today is synonymous with financial economy. There are conditions under which each industrial plant may be run without smoke, but the demands upon the plant as designed or as operated may be such as to prohibit successful commercial operation without smoke production. There are two problems, one, efficient, smokeless combustion; the other, the efficient operation of an industry in which full economy may be a secondary issue. In so far as smoke elimination rests upon the direct use of bituminous coals in furnaces for power, heating or lighting, I am convinced that we are but deceiving ourselves if we believe that any great degree of success can be secured through the methods used in the majority of cities by political appointees whose term of office may be from two to four years and who from necessity are forced to consider the uncertainty of future employment. Smoke prevention founded on a well defined, engineering basis and on a sound commercial policy

that eliminates as far as possible unnecessary antagonism is a problem quite possible of satisfactory solution, but it is not a simple problem of two or of five years' duration. Five years might show progress; ten years marked results; but complete and financial elimination must not be expected short of twenty or twenty-five years.

I would not fine everybody that makes smoke today, but would so frame laws that every new plant that is installed and every old plant that is remodeled must be adapted to the fuel to be used. The life of a boiler plant is about twenty years, and within the twenty-five year period every plant now installed will necessarily require renovation.

There are today few engineers sufficiently familiar with the problems of smokeless combustion in commercial plants to enable them to design with guaranteed success furnaces adapted to the large variety of fuels available.

In the light of researches now being carried on by industrial concerns, university laboratories and the United States Bureau of Mines, the time will surely come when competent engineers will be thoroughly equipped for the successful solution of this problem of smoke prevention coupled with industrial efficiency. Substantial results may be expected when we look the facts squarely in the face; when public sentiment is stimulated through reliable engineering data and not by spectacular or unreliable statements; and when the enforcement of regulations is absolutely divorced from political associations.

By placing the problem in the hands of a properly constituted commission, backed by proper legal authority, supplied with ample funds and supported by a real public sentiment, satisfactory results may confidently be expected.

Not until some such procedure is followed, can we look for real smoke abatement.

HEBREW AND BABYLONIAN VIEWS OF CREATION*

By Morris Jastrow, Jr.

Professor of Semitic Languages, University of Pennsylvania

The desire to trace things to their origin is so strong in man as to suggest the possibility of its being a deeply ingrained instinct. From the child's curiosity to see the wheels go round to the question, "what makes them go round?" is merely a step, and from this, again, to "who makes the wheels?" another step, and not a very large one. Curiosity is, indeed, the beginning of wisdom, and the most modern and most advanced scientific spirit is merely curiosity, plus the application of a proper method to satisfy it. Creation stories abound everywhere among people in a primitive state of culture, the stage of naïve curiosity, and from this stage they are carried over to the higher level, the stage of methodical inquiry, modified somewhat and transformed to adapt them to higher points of view but in all essentials they are still the old stories, handed down from generation to generation by word of mouth until through the rise of the literary spirit they are given a definite form. The characters in these early endeavours to picture the universe coming into being are naturally the gods, and as the religious life, keeping pace with the social status and the political turmoils, becomes more definitely regulated, the gods assume a definite relationship to one another with variations in rank corresponding to those

* This lecture was subsequently embodied as Chapter II of a volume by Professor Jastrow entitled "Hebrew and Babylonian Traditions," and published by Charles Scribner's Sons, New York, 1914. This volume deals, in addition to a comparison of Hebrew and Babylonian Creation tales, with Hebrew and Babylonian accounts of the Deluge, Hebrew and Babylonian views of life after death and Hebrew and Babylonian ethics, together with a general survey of the relations, historical and otherwise, between Hebrews and Babylonians. The chapter here published is reproduced from the volume by the kind permission of the publishers.

which hold good for human society. Instead of an indefinite series of powers, representing the personification of the many forces manifesting themselves in nature and that condition man's welfare, we have a selection, and the powers so selected form a pantheon which becomes more or less systematically organised. At this stage Creation stories—one may say everywhere, for the exceptions if such there be are negligible—assume the character of a nature-myth, that is to say, a story of some occurrence in nature in which gods as actors personify the occurrence itself. The particular myth chosen will depend largely upon climatic conditions. In tropical districts, suitable for man in the early stages of culture, the two seasons of the year, the rainy and the dry, generally suggest by analogy the change from the rainy to the dry season as the beginning of the universe, or at all events, as the condition for the appearance of life in nature, of regularity and order as contrasted with the violence of storms and the destruction wrought during the rainy season, when forces of disorder seem to be in unbridled control. Such is the case with the various versions of Babylonian Creation myths that have been preserved, wholly or in part, but which appears most clearly in what may be designated as the main version. This is the story of a contest between the forces of evil and lawlessness, symbolising the wintry and rainy season, and the opponents of these forces endeavouring to establish law and order.

We can now say with certainty that in each one of the great religious centres of Babylonia substantially the same story was told, with merely a different arrangement of the actors on the stage. The hero who triumphs in the contest with violent forces is in each case the chief deity of a particular centre. So in Nippur, which early acquired a sacred position, it is Enlil, the patron of the city, who is represented as quelling a general uprising of the powers of nature. At Eridu, situated on or near the Persian Gulf, it is a water deity, Ea. At Uruk it is a solar deity, Anu; and, no doubt, at Sippar, the chief city of the worship of Shamash (the general designation of the sun),

it was the sun-god who was pictured as the conqueror. But these originally distinct and early phases all gave way in time to the claims of the god of the city of Babylon, Marduk, who, with the rise of Babylon as the political capital of the entire Euphratean Valley, definitely assumes the headship of the pantheon. In its final and most elaborate form the Babylonian Creation story thus becomes a pæan in praise of the power of Marduk, who, endowed with the attributes of all the other gods and thus surpassing any one of them in strength and glory, is represented as accomplishing a task in which others fail, or from which they shrink. The local variations of the nature-myth are combined, but instead of any of the local gods, whether sun-deities or water-gods or storm-gods, succeeding in establishing order and in creating the universe, they are represented in this final version as having been foiled in the attempt and as proclaiming Marduk to be the only one who can overcome the chaotic condition produced through the rainy and stormy season. This condition was at an early date symbolised as the rule of a huge monster, with an army of minor but yet formidable monsters at her command.

Let us take up this story, which is known to us chiefly from fragments of clay tablets in the library of Ashurbanapal, King of Assyria (668–626 B. C.), though we also have some portions of it in neo-Babylonian tablets from some of the temples in the south, such as Babylon, Borsippa, and Sippar.* In addition to these we have much-distorted accounts in Greek writers, quoting as their source Berosus, a Chaldean priest who flourished in Babylonia towards the end of the fourth century, and who wrote a history of Babylonia and Assyria which is unfortunately lost. The story, which is poetic in form, begins as follows:

> When above, the heavens were not named,
> Below, the terra firma was not called a name.
> Apsu, first of their seed,

* See the complete publication of all the material, with a translation and commentary by L. W. King, *The Seven Tablets of Creation* (London, 1902. 2 vols.).

Mummu (and) Tiamat, producer of all of them,
Their waters were joined together,
Soil had not yet been marked off, shoot had not yet sprung up.

There was a time when none of the gods had as yet burst forth,
Not been called a name, fates had not been fixed;
Then were created the [twelve gods],
Lakhmu and Lakhamu burst forth.
Ages increased.
Anshar and Kishar were created and over them . . .
Days grew long—there came forth . . .
Anu, their son . . .
Anshar, (?) Anu . . .
Nudimmud whom his father [had begotten],
Abounding in wisdom, . . .
Exceedingly strong, . . .
Without a rival, . . .
Thus were established [the great gods].

The attempt is evidently made here to set up a genealogy of the gods and we are fortunately in a position to supplement this enumeration through lists that have come down to us in the library of Ashurbanapal,* of powers or deities that are designated as the twenty-one male and female offspring of a divine progenitor symbolised as the heaven or the god of Heaven. To be sure, such lists represent the purely theoretical speculations of later priests or theologians, but they are nevertheless valuable as embodying traditions of ages when other gods than those which formed the object of worship in later times existed. In only a few cases do we know the nature of these early deities, but we are reminded in a general way of the similar genealogies found in Hesiod's Theogony, giving us several successive generations of deities who presided over the Olympian pantheon. First in order are: Gaia (Earth), and Uranos (Heaven), who produce the Titans, the youngest of whom, Kronos, establishes a new rule which in time is replaced by that of Zeus, though not before many other series of gods are brought forth through Kronos and Rhea. The

* Published in *Cuneiform Texts from Babylonian Tablets, etc., in the British Museum*, Parts XXIV–V.

analogy between Hesiod's Theogony and that devised by Babylonian theologians can be carried further, for in both cases the ultimate source to which the powers—or, what amounts to the same thing, the generations of gods—are traced back is the heaven, the Uranos of Hesiod corresponding to Anu in the Babylonian list. In Hesiod's Theogony Kronos and Rhea, just as Zeus and Hera, represent a divine pair. The male element in both instances is again identical with the heavens, precisely as is Uranos, the earliest progenitor of divine beings, while Rhea and Hera as the female elements are types of Gaia (the Earth), but become in both the Babylonian and the Greek systems merely consorts of the god of Heaven. The Babylonian lists of divine pairs thus bring out the same thought as found among the Greeks, only in a more definite and clearer form. An (the sign for Heaven) and Ki (Earth) are identified in these lists with Anum and Antum, the divine pair, the god of Heaven and his consort. In the same way the other pairs in these lists, like Ib and Ninib, An-shar-gal and Ki-shar-gal (*i. e.*, "the great universe of what is above" and "the great universe of what is below"), An-shar and Ki-shar, Du-ur and Da-ur, Lakhmu and Lakhamu, Alala and Belili, En-ur-ul-la and Nin-ur-ul-la, are merely so many designations of the same divine pair symbolised by the heaven as the male element, while the female element, originally the earth or that which is below, fades into a mere reflection of the male element and becomes the female companion of the god of Heaven. Hence the interchange in these names between the use of the element Ki, which means the earth, and Nin, which signifies the female element without further qualification.* The later stratum of thought is also shown by the divine pair to which these groups are traced back and which are no longer heaven and earth, but heaven and his heavenly consort, Anum and Antum, both being actually designated by the same sign—a star, as a symbol of the heavenly expanse.

* The later male element corresponding to Nin is En.

All this points to the tendency both among the Greeks and Babylonians to give to the pantheon an astral character; in other words, to project the gods, quite independently of their original character, on to the heavens. We shall have occasion to refer to this later on. I mention it here as an illustration of the frankly materialistic aspect of the Babylonian theology. This limitation in the conception of the divine involved the association of the manifestation of the divine with some substantial, visible object. "The heavens proclaim the glory of God," says the Psalmist,* in a sublime burst of admiration at the beauty of the stars; for the Babylonian the heavens proclaimed the gods—*were* gods. Between the two conceptions lies the difference between a spiritualistic and a materialistic faith, a view of divine government expressed in poetical metaphors as a means of conveying ideas for which ordinary language does not suffice, as against the literal interpretation of the metaphor. This materialistic aspect is the characteristic keynote of all the Babylonian Creation stories, and this despite certain impressive features, particularly in the Marduk epic, which we must not overlook. Let us proceed with the account.

The Theogony of Hesiod assumes at the beginning of things, Chaos, apparently conceived as an immeasurable empty space; then comes the triad Earth (Gaia), the Depth (Tartaros), and Love (Eros). Out of Chaos come Erebos and Night, and from these, the Atmosphere (Ether) and Day (Hēmera). The process of creation was thus evolution from darkness to light. This triad—Gaia, Tartaros and Eros—has a counterpart in the speculations of the Babylonian theologians in Apsu, Mummu, and Tiamat; but more consistently, or at least more reasonably, than the Greek speculation, Chaos is pictured as a time when water alone filled all space. Apsu, antedating heaven and earth, is the watery expanse. Tiamat, "the mother of all," associated with Apsu, is the watery deep, and

* Psalm 19:1.

Mummu, apparently the offspring of the two through the commingling of their waters, is again a term signifying water. It is a time of "water, water everywhere." A later attempt at differentiation makes Apsu the sweet, and Tiamat the bitter or salt waters, with Mummu as the generic designation for water without further specification. However this may be, Apsu and Tiamat, in the continuation of the story, are represented in control, with Mummu as the messenger and an army of monsters as followers. The description of these monsters as "huge serpents, sharp of tooth and with merciless fangs, their bodies filled with poison instead of blood, dragons, raging hounds, scorpion-men, fishmen, devastating tempests, and fish-goats, all bearing cruel weapons, and fearless of spirit," reminds us of the Cyclops and the Hekatocheiron (the hundred-handed monster), who in Hesiod's Theogony form part of the progeny of Gaia and Uranos by the side of the Titans. Berosus also, in his Babylonian history,* recalls these traditions of an age in which monstrous beings of hybrid form flourished. In Hesiod we do not learn, however, of any opposition between this army of monsters and the gods, whereas the main features of the Babylonian tale rest on a coming conflict between the two forces. The monsters are not the creation of Anu and his consort, or of An (Heaven), and Ki (Earth), but the brood of Apsu and Tiamat; and if we may follow Berosus, who says that a woman named Homorka† presided over this strange host, a version existed in which the female element as the source of the monstrous brood was alone introduced.

Apsu and Tiamat are disturbed through the creation of the gods—Lakhmu, An-shar, Anu, Nu-dimmud and their consorts. They feel that with the gods a new element has been introduced presaging the end of their own rule. The daybreak of a

* See the translation of the passage in Cory, *Ancient Fragments*, p. 58; or Zimmern, *Keilinschriften und das Alte Testament*, pp. 488 *seq.*

† Homorka is a corruption of some Babylonian or Sumerian term. Since in the course of the story a female being, Ummu-khubur, is introduced, pointing to a version in which she takes the place assigned to Tiamat in our story, it may well be that we have here the original and correct form of Homorka.

new order is always coincident with the twilight of the gods of the dissolving order, but the old does not pass away without a severe struggle. Accordingly, Apsu and Tiamat decide to call upon their forces for a desperate encounter for life and death. We can detect in the description of the struggle traces of several versions, each presumably belonging to a separate centre that have been combined in accord with the regular principle of composition in the ancient and later Orient, which in myths, legends, and historical narratives is always and essentially a combination of existing traditions. Taking the version however as it stands, the undercurrent of thought which betrays the higher spirit of the priests in their remodeling of nature-myths is the contest between the chaotic and lawless conditions symbolised by Apsu and Tiamat and their followers on the one hand, and order and higher law on the other, represented by the gods. The new order is the higher one, in which respect we again find an analogy with Hesiod who places the rule of Kronos on a higher plane than that of his father, while Zeus as the son of Kronos becomes the symbol of law and justice.

Apsu and Tiamat bewail the growing power of the gods: "By day I have no rest, at night I have no sleep; but I will wipe out their course; I will sweep them away; lamentations shall set in and after that we shall have rest again." Mummu comes to give counsel to Apsu and Tiamat, and the three plan a test of strength. There are indications at this point of the story that in an earlier version the gods selected Ea (or Nudimmud) to head the fight in their behalf.* Since Ea is the chief god of Eridu—probably the oldest of the sacred cities of Babylon—the prominence of Ea points to a version originating in this centre. If this be so, we may be sure that in this version Ea was celebrated as the vanquisher of Apsu and Tiamat. In another version Anu was depicted as leader and victor, pointing to a form of the story that originated in Uruk,

* See the writer's article, "The Composite Character of the Creation Story," in the *Nöldeke Festschrift*, II, pp. 969–982.

the seat of Anu worship; but Ea and Anu must yield their claims to a greater than either, to the favourite of all the gods who succeeds where others failed, who excels them all in strength and courage. This is Marduk, the chief god of Babylon. In his interest, and to add to his glory, all the other versions of the nature-myth are transformed so as to lead up to his triumph over chaos and lawlessness. Instead of Ea and Anu despatching the army of monsters, they are represented as succeeding merely in disposing of Apsu and Mummu, but Tiamat, the mother of the brood of monsters, remains at large.

As already suggested, Apsu, Mummu, and Tiamat are identical figures and represent the various names given to the same chief symbol of watery chaos in various centers but combined in the latest form of the story and placed in relationship to one another. In Babylon the name of the chief monster was Tiamat. She is, therefore, the one against whom Marduk in the final form of the tale directs his attack, but the story also implies that with Apsu and Mummu out of the way little has been accomplished, so long as Tiamat flourishes. Once more with true epic breadth the army of monsters, banded together at the side of Tiamat, are described in terms calculated to strike terror in the breast of the gods. Eleven monsters of especially terrific aspect are fashioned by Tiamat. She makes Kingu her consort and appoints him as the general of the army. To Kingu she assigns the command over all the gods and as a sign of his power hangs the tablets of destiny on his breast. The main thought of the story, as thus more revealed, is to picture the opposition between the old and the new order, but with this nuance, that the new order has already proceeded far enough to place the gods in control and that only Tiamat remains to be overcome. In her despair Tiamat takes the offensive and openly revolts, assuming the power of decreeing fates which, it is implied, already belongs to the new order about to triumph. Thus, as the story takes final shape, new features are introduced which, while adding

also to the dramatic power, are of value chiefly because they reflect the thought and speculation of the compilers.

Anshar, who presides over the assembly of the gods convened to take measures for quelling the revolt, calls upon his son Marduk to stand up against Tiamat.

> The Lord rejoiced at the word of his father,
> He drew nigh and stood in Anshar's presence.
> Anshar looked on him and his heart was filled with joy,
> He kissed him on the lips and fear departed from him.

Marduk declares his readiness to go against Tiamat. Nay, he is impatient to trample her under foot, but exacts as a condition that in case of success he shall be supreme in command.

> "If I, your avenger," he says to Anshar,
> "Vanquish Tiamat and give you life,
> Then appoint an assembly, make my destiny supreme.
> In Upshukkinaku* seat yourselves joyfully.
> My word instead of yours shall decree fates.
> What I determine to bring about shall not be altered;
> The utterance of my lips shall not be taken back or superseded."

These lines reveal the aim of the story in its final form, namely, to explain and to justify the supreme rank accorded to Marduk as the head of the later Babylonian pantheon. He won his right to this claim by virtue of his power, and the claim is thus carried back in the poem to the beginning of time. The story of Creation becomes secondary to the purpose of singing the praises of Marduk. Hence three of the seven tablets are taken up with a description of the preparation for the final conflict and with the conflict itself, ending in the complete discomfiture of Tiamat. The materialistic aspect of the old nature-myth is emphasised to such a degree in these three tablets as to border on vulgarity. The gods are

* The mystical chamber of fate in which the gods meet for counsel and for decreeing destinies.

so happy at the prospects of Marduk's victory that they gorge themselves at a banquet and become roaring drunk.

> They were greatly at ease, their liver was exalted,
> For Marduk, their avenger, they decreed power.

Even before he sets out they address him as

> Marduk, thou art our avenger!
> We give thee sovereignity over the whole universe.
> . . . . . .
> Thy fate [*i. e.*, thy power] be supreme among the gods!
> For destroying and creating speak thou the word and it will be fulfilled.

As proof of his power he is told to command a garment to vanish, and it promptly disappears; and upon his command it reappears. He is hailed as "Marduk is King!" Sceptre, throne, and ring are bestowed on him, and weapons are offered to him.

> Go and cut off the life of Tiamat
> And let the wind carry her blood to remote places.

Marduk then arms himself with weapons which betray the naturalistic element of the original story. He provides a net with which to enclose Tiamat; he stations the winds as gods, so as to prevent her escape; various destructive winds are created by him and sent forth to arouse Tiamat. He then mounts his chariot, which is called "The Storm," and drives headlong towards the monster. In terror and dismay Tiamat utters her powerful charms, but they are of no avail. Undismayed, Marduk approaches.

"You and I," he shouts, "come, let us fight." Graphically the encounter is described. Tiamat in a rage opened her mouth, and Marduk drove in the evil wind which filled her belly. She gasps for breath, and Marduk, taking advantage of this moment, seizes the spear and bursts open her belly, severs her entrails and penetrates clear to her heart. The army of Tiamat flees in terror, but the monsters are all caught in Marduk's net and held prisoners.

Thus the opposition to the gods is overcome, and Marduk to symbolise his control takes from Kingu, the consort of Tiamat, the tablets of fate ("which were not rightfully Kingu's," the text adds) and hangs them on his own breast. With the triumph of Marduk over Tiamat the story returns to its original purpose, the account of Creation.

This account thus turns out to be a curious mixture of primitive notions such as are found in cosmogonies of other peoples, with a more advanced symbolism that leads Marduk, for example, to split the flattened body of Tiamat in half and to use one side of it as a covering for the heavens. He draws a bolt across the expanse and stations a watchman, so as to restrain the waters from gushing forth. This is a purely primitive conceit to account for the control of the waters that come from above. Water, as the primeval element, is still everywhere as it was in the beginning, only under control—below, through the bounds set to it; above, through the expanse which is stretched like a covering or curtain across the heavens. The same picture of the waters above and below and of the expanse to prevent the upper waters from escaping is found in the biblical story; but combined with this naïve and childlike conception there is in the Babylonian tale the more advanced thought that through the sun of the spring, symbolised by Marduk, the storms and rains of winter are driven back to the heavens and kept in control there like prisoners behind bolts and bars under the surveillance of a watchman.

Still a third and likewise a relatively advanced thought is woven into the primitive tale, one that is closely bound up with Babylonian-Assyrian astral mythology, according to which there is a perfect correspondence between phenomena on earth and the occurrences in heaven. The waters of the earth are regarded as united to one another. They encircle the earth which was conceived of as a floating island, but these waters have their counterpart in the heavens. Marduk, accordingly, is represented as measuring out space for the

waters in heaven to correspond to the structure of the deep. Nudimmud, or Ea, as the god of the waters, is projected to the heavens and becomes the lord of the upper as well as of the lower waters, for whom a large mansion is constructed. The continuation of the story is even more astral in character. The heavens in Babylonian-Assyrian astrology were divided into three large divisions, one assigned to Anu, the second to Enlil, and the third to Ea. These three gods constitute a triad that plays a great part in the theology of Babylonia and Assyria. Originally local deities, Anu is the sun-god whose centre of worship was in Uruk; Enlil, the chief god of Nippur and the head of the older Babylonian pantheon, is a storm-god who, however, also absorbs the attributes of solar and agricultural deities; while Ea, a water deity, had his centre at Eridu and presided over the Persian Gulf—the father of all the waters, from the Babylonian point of view. In time, and through a process which we cannot stop to consider here, these three gods are delocalised and become abstractions symbolising the three regions of the universe, the heaven above, the earth and the atmosphere immediately above it, and the waters around and under the earth—the same three divisions which we encounter in the Decalogue, where in evident allusion to the personification of the three divisions, the prohibition is emphasised against making "any image of what is in the heaven above, on the earth beneath or in the waters under the earth" (Ex. 20:4; Deut. 5:8). Under the influence of astrological doctrines which transformed popular beliefs into a more systematic theology, Anu, Enlil, and Ea—as the three factors controlling the universe—are projected on to the heavens and become the three governors of the starry heavens, each having a region of his own. The heavens then become the domain or, as the Babylonians called it, the "way" of Anu, Enlil, and Ea. All the great gods, irrespective of their origin, are projected on to the heavens—symbolised by stars. Marduk assigns places to these gods. Astrology forming the basis of the calendar, the year is divided into twelve months by

Marduk and placed under the control of the stars. He fixes the courses of the planets; he places a gate at either end of the heavens. Through the one the sun was supposed to pass out in the morning and to enter through the other at night; he intrusts the night to the moon-god and regulates the phases of the moon. At this point, unfortunately, the fifth tablet in which this work of Marduk is detailed becomes defective, but enough remains to warrant the assumption that the chief constellations are also established in their places in the heavens. Whether there was also included in the tablet an account of the creation of plants and verdure on the earth, as has been supposed by some scholars, is a point in regard to which no certain conclusions can be reached because of the defective condition of the tablet. Up to this point, then, we have only four themes: (1) the description of primeval chaos; (2) a conflict between the older and the newer order; (3) the triumph and glorification of Marduk; (4) the regulation of the movements in the heavens or astral cosmogony, if this expression be allowed. A detailed plan of creation does not, therefore, appear to have been the main aim, at least of this version, of the Babylonian tale—and this despite the fact that in the sixth tablet the creation of man is introduced.

The point of view from which this work of creation is done is interesting. The gods are in full control. The older order represented by Apsu, Tiamat, Mummu, Kingu, Ummu-khubur has disappeared. The gods ought to be happy, but apparently are not. They are lonely in their solitary grandeur, just as Adam is represented as being lonely without a companion; but the loneliness of the gods is of a different order. The Babylonians could not conceive of gods without temples and worship. His view of divine government of the universe was limited by his conception of the gods themselves and their consorts. Creating their gods in their own image, the Babylonians, in common with other peoples of antiquity, endowed them with purely human attributes and needs. Hence the gods have female consorts and raise families. They are rulers,

but as such they must not only have a kingdom to rule over like earthly kings, but they demand homage and tribute. What is the use of being a god if there is no one there to pay worship—if there are no temples in which offerings and sacrifices can be brought and homage paid? Strange as it may seem, the complaint of the gods to Marduk that they feel lonely, unhappy, and neglected because there is no one to worship them is assigned as the reason for the creation of man. It is provoking that the sixth tablet in which the creation of man is recounted breaks off at the most important juncture. Let us hope that a lucky chance will some day supply the missing sections without which our view of the Marduk epic of necessity remains defective. The opening lines read as follows:*

Upon Marduk's hearing the utterance of the gods he was prompted to carry out [a clever plan].
He opened his mouth and unto Ea [he spake],
What he had conceived in his heart he revealed to him.
"My blood I will gather and bone [I will (take)],
I will set up man that man may . . .
I will create man to inhabit [the earth],
That the worship of the gods may be established, that shrines [may be built].
I will change the ways of the gods, I will alter.
Altogether shall they be honored, against evil [will they set their face]."

What a contrast to the biblical account where man is created in the image of God to be the crowning point of the universe, placed in an earthly Paradise by the favour of the Almighty; whereas here man exists because the gods are lonely and in their vanity crave worship and adoration. An interesting feature, however, of the Babylonian narrative which redeems it in a measure from its crude aspect is the creation of man from the blood of Marduk himself. This touch is confirmed by the account in Berosus which, preserved for us through

* The bracketed words indicate conjectural restorations of defective lines.

secondary sources,* confirms the cuneiform account, though the tradition has become somewhat distorted. Bel, as Marduk is called in the extract from Berosus, seeing that the earth was not cultivated, is represented as cutting off his head or ordering one of the gods to do so; and from the flowing blood mixed with earth, man was created. Through this blood man is brought into association with the gods—a link is forged connecting man with the divine. We may properly assume that this thought was in the mind of the compilers of the Babylonian tale, and that it reflected the view held of man's dignity, thus rising supreme over the animal world. In so far man and God are, as it were, placed on the same level; and the association of the two plays a part in the Babylonian theology which, *e. g.*, in the case of the hero of the national epic, describes Gilgamesh as two-thirds god and one-third man. The deification of kings which we encounter at various points of Babylonian history† is another expression of this relationship between gods and men, which is involved in the doctrine that gives to man the blood of the gods.

The Babylonian-Assyrian religion may be said to revolve largely around the two ideas which we find expressed in the sixth tablet of the Marduk epic—the worship of the gods as one of the purposes for which man exists, and the presence of a divine element in man, typified by the blood of Marduk which is the life-giving quality of the god's own being. It is a fair inference that the continuation of the sixth tablet embraced an account of the creation of animals—as given in the tradition of Berosus—and perhaps also of plants. At all events, towards the end of the tablet we see the gods assembled in Upshukkinaku—the great hall where the fates are determined. Marduk has snatched from Kingu the tablets of fate and hung them around his own neck. He is hailed as the great conqueror who has delivered the gods from their opponents;

* Through Alex. Polyhistor and Nicholas of Damascus (sixth century A. D.). See the translation in Cory's *Ancient Fragments*, p. 60; or Zimmern, *Keilinschriften und das Alte Testament*, pp. 489 *seq.*

† See on this King, *History of Sumer and Akkad*, pp. 251, 273, *seq.*, 298 *seq.*

and the seventh and closing tablet of the series is taken up with the enumeration of the fifty names bestowed upon Marduk—names that represent in part attributes to indicate his manifold powers, in part other gods whose essence and powers are transferred to him as the one who absorbs the minor and most of the major gods of the pantheon. Attached to each name is an explanation of its meaning and application. Asari, "the bestower of planting, the establisher of seeds, creator of grain and plants, causing the green herbs to spring up;" Asari-alim, "revered in the house of counsel;" Asari-alim-nunna, "the mighty one, the light of the father who begat him, who directs the commands of Anu, Enlil, and Ea;" Tutu, "who creates anew;" and so on through the long list celebrating Marduk as the sun-god, as the god of vegetation, as the creator of everything on earth, and as the guide of the movements in the heavens. He thus becomes in fact the god of heaven and earth, "without a rival among the gods," as it is expressly stated. Besides attributes of strength, ethical qualities are also ascribed to him among the titles heaped upon him. He is the subduer of the disobedient, director of righteousness, the destroyer of all the wicked; but the climax is reached when the older heads of the pantheon—Enlil of Nippur, and Ea of Eridu, whom Marduk supplants—bestow their names upon him, and with their names their very beings in accordance with the ideas anciently associated with the name.*

"The lord of the worlds," father Enlil called him,
The designation proclaimed by all the Igigi.†
Ea heard it and his liver rejoiced.
"He whose name his father made glorious
Shall be even as I—Ea be his name.
The control of all decrees be his sphere.
All my commands shall he make known."

Thus the older version in which Ea is celebrated as the creator is combined with the new one. Ea is replaced by Mar-

* The name, according to the prevailing view in antiquity, is the essence of a being or object. To have a name is to exist; to wipe out one's name is to destroy one.

† A name comprising a lower order of divine beings.

duk. The aim of the story—the celebration of the deeds of Marduk—is distinctly avowed in the epilogue attached to the narrative, in which all are called upon to hold the fifty names in remembrance.

Let the wise and the man of understanding consider them together,
Let the father repeat them and teach them to his son,
Let them resound in the ears of pastor and shepherd.
May one rejoice in Marduk the lord of the gods,
That his land may prosper—glory to him!
His word stands firm, his command is unalterable,
The utterance of his mouth no god alters.
If he is enangered, his neck is not turned,
If he is wroth, no god can oppose him.
But wide is his heart, broad is his compassion.

These closing lines touch the high-water mark of religious thought in Babylonia and Assyria. They show that even in a materialistic conception of divine government and despite the crude manner in which primitive traditions are handed down, the deeper religious note is sounded, and the aspiration of man to reach out to an understanding of the mysteries of life and of the universe finds an utterance, even though it be a weak one.

There is another Babylonian version of the story of Creation* which likewise shows evidence of having been adapted from an older form to serve the purposes of the priests of Babylon to add to the glory of Marduk, and about which a few words need to be said before we pass on to a consideration of the Hebrew accounts. It is important to note that in this second version—unfortunately preserved only in part—the same idea that the earth existed primarily for the sake of the temples of the gods can be traced. As in the other version, the primitive state of things is pictured as a time when the waters covered everything, but the interesting touch is added that the dry land appears through the gathering of the waters into a channel. In order to describe the primeval period the

*See King, *Seven Tablets of Creation*, II, pp. 130–9—a Sumerian original with an Akkadian translation.

account begins by saying that no holy house, no house of the gods, no sacred place had been built. It continues as follows:

> No reed had sprung up, no tree had been planted,
> No brick laid, no building erected,
> No house made, no city founded.

It will be observed that there is no direct reference to the fact that the earth did not exist. Its existence, indeed, appears to be assumed, only that it is submerged through the waters which everywhere abound. The account then mentions three of the most ancient cities—Nippur, Uruk, and Eridu—and says that none of these three had been founded and their temples did not yet exist. Again, it will be observed, the association of city with temple, as though the one without the other were inconceivable. "All the land," the account continues, "was sea."

The adaptation of the older version to a form which would accord with the position of Marduk as the head of the pantheon is to be seen in the enumeration of the first places to appear after the waters had flowed into a channel, in consequence of which the dry land came into view. Eridu and Babylon take the place of Nippur, Uruk, and Eridu in the opening lines of this version. We might, indeed, have expected Babylon to be mentioned as the first city, but a concession is made to established tradition in joining Eridu with Babylon because of the close association between Marduk, the god of the city of Babylon, and Ea, the god of the much older city of Eridu. Marduk, despite his position at the head of the pantheon, is invariably and through all periods of history designated as the son of Ea, which points to the transfer of the Marduk cult from Eridu to Babylon. This transfer is also shown in the circumstance that the name of Ea's sanctuary at Eridu is identical with that of Marduk's temple at Babylon, called E-Sagila, the "lofty house." We therefore read in this second version:

> Then Eridu was established and E-Sagila built.
> E-Sagila where in the midst of the deep the god Lugal-dulazagga has his dwelling.

Babylon was built, E-Sagila completed.
The Anunnaki* together were created.
The holy city, the dwelling of their choice, they proclaimed as supreme.

The purpose of these lines lies on the surface—to justify the pre-eminent position occupied by the city of Babylon, the sanctity of which is thus carried back to the very beginning of time. As in the first version, mankind is created by Marduk for the sake of the gods, though the purpose is put somewhat differently in this version.

In order that the gods may be induced to dwell in the dwelling place of their choice, he created mankind.

The gods proclaim Babylon as the city of their choice, but in order to induce them to retain this preference for all times, mankind is created to render them the homage and tribute that will keep them in a happy frame of mind, favourably disposed for all time towards the city of their heart. At this point the most interesting feature of the second version is introduced. A distinct reference is made to an earlier form of the story in which Marduk is the creator but in association with a goddess Aruru. In order to combine Marduk with Aruru the old version is modified to read:

The goddess Aruru, together with him, created the seed of mankind.

We have not, as yet, been able to ascertain in what centre this goddess Aruru was worshipped. We come across her occasionally in the religious literature, but generally as the consort of Marduk. The circumstance, however, that in this second version her name appears first and that it is she who, together with Marduk (and not vice versa), creates mankind is most significant as a proof that in the older form of the story the prominent part in the creation of mankind, at least, and probably also in the creation of animals, was played by the

* Another name to comprise a lower order of divine beings like the Igigi (above, p. 87). As a means of differentiating between the two, the Anunnaki are represented as the spirits of the earth, and the Igigi as the spirits of heaven.

personification of the female principle in nature. There now follows in a systematic though brief form the account of the creation of animals and of verdure.

> Cattle of the field, living creatures were created in the field.
> (Tigris and Euphrates were created and placed in position;
> Good names were given to them.)*
> Grass, reed, . . . were created.
> The verdure of the field was created.

The composite character of the account is revealed in the following lines, showing evidently a variant account with an interesting distinction between wild and domesticated animals:

> Lands, marshes and steppes,† . . .
> The wild cow and her young, the wild calf,
> the ewe and her young, the lamb of the stall,
> Gardens and woods,
> Goat and wild mountain goat.

It is not necessary for our purposes to consider the problems involved in this compilation in detail. We may content ourselves with the general statement that in the older forms of this second version the beginning is made with the creation of mankind in order that he may worship the gods; that this creation was brought about by the goddess Aruru, who also brings into being the beasts of the field and the living creatures of the field. Then, in order to make the earth habitable, reeds are formed, trees created, bricks laid, buildings set up, houses erected, cities established, living creatures placed therein; and, finally, corresponding to the enumeration of cities at the beginning of the story:

> Nippur was established, E-Kur‡ was built,
> Uruk was made, E-Anna§ was erected,
> Eridu was made, E-Sagila built.

The tablet on which this second story is recounted turns out to be an incantation text. Accordingly, after the story is fin-

* These two lines represent, I believe, a later insertion.
† The exact meaning of two further terms for plant life escapes us.
‡ "The mountain house"—the name of Enlil's sanctuary in Nippur.
§ "The heavenly house"—the name of the goddess Nanâ's sanctuary in Uruk.

ished, the writer passes on to a prayer and to instructions for the ritual in connection with the recital of the sacred formulas.

In the same way we find in other texts forming prayers or incantations references to the great contest against Tiamat, to the creation of mankind, and to early conditions existing on the globe. So, in one of these texts* the enormous size of the dragon is dwelt upon as covering about three hundred miles in length and six miles in breadth, his mouth measuring six cubits and his ears (?) fourteen cubits. The variations in current tradition are illustrated in this account of the dragon by making the one who despatches it not Marduk but a god Tishpak; and, strangely enough, the dragon is represented as appearing after mankind had been created and cities had been founded. This touch is of importance as furnishing a further proof for the thesis that all the versions of creation current among the Babylonians and Assyrians are merely poetic representations of the contest between winter and spring. There is no real creation of the world in the correct sense of the term, but only a conquest of the waters at one time covering everything, driving them back, as it were, so as to afford a place for the dry land.

In the same way the gods, or at least the same group of gods, are regarded as having been in existence even at the beginning of things. The only real act of creation is that involved in putting man on earth in order to serve the gods—and in connection with man, other forms of animal life; while verdure and plants are represented as springing up naturally after the dry land had appeared. Perhaps even animal life was placed here for the sake of man, just as the vegetation that sprung up on the earth is assumed to exist because it is necessary for man's subsistence. Without pressing this point too far, emphasis should, however, be laid on the limited scope of creation in the Babylonian-Assyrian stories. The main point of view is not to indicate the source or the successive stages in the work of creation, but to ascribe to the one god or the other

* King, *ib.*, II, pp. 116–127.

the glory of having conquered the storms and rains of the wintry seasons, symbolised by a great monster who is surrounded by a host of lesser monsters. In other words, the glory of some local deity is the leading thought in all these versions, and for our purposes it matters little whether the divine hero is Enlil, Ea, Marduk, Tishpak, or the goddess Aruru. The nature-myth predominates.

A still older form of the nature-myth has recently been discovered by Doctor Arno Poebel* in the collections of the University of Pennsylvania. In contradistinction to the main version, which is in Babylonian, this new text is written like the second version in Sumerian, but without an accompanying translation—an indication of its great antiquity. Coming from the temple archives at Nippur, it is natural to find a part in the work of creation assigned to Enlil; but associated with Enlil is his consort Ninkharsag,† besides Anu the god of Uruk, and a deity, Enki, or Ea, the water-god of Eridu. The association of Anu, Enlil and Enki clearly points to a combination of this Nippur version with older Uruk and Eridu versions. The Sumerian priests of Nippur evidently received their account of Creation from still older centres, of whose history we know as yet practically nothing, but transferred the rôle of creator to their favorite, Enlil. In this version we are told:

After Anu, Enlil, Enki and Ninkharsag had created the blackheaded people,

. . . . . .

The animals, the four-legged ones they artfully created.

. . . . . .

Then he established the sublime commandements and precepts.
He founded . . . cities on clean spots.
Their names were called and they were allotted to . . .
[As the first] of the cities he assigned the city of Eridu to the leader Nudimmud
Secondly, he assigned the city of Bad-nagar-dish . . .

* "Historical and Grammatical Texts Chiefly from Nippur," Text No. 1 in vol. VI of the new series of the 'Babylonian Publications of the Museum of Archæology of the University of Pennsylvania' (Philadelphia, 1914).

† Also called Nintu.

Thirdly, he assigned the city of Larak to Pabil-kharsag
Fourthly, he assigned the city of Sippar to the warrior Shamash
Fifthly, he assigned the city of Shuruppak to the god of Shuruppak.

The order in which the great cities of the Euphrates Valley arose naturally differs in the different versions, but it is interesting to note that in this new version also Eridu is assigned the first place, a valuable indication of the oldest source to which probably all the Babylonian creation stories are to be traced.

The story then passes over to an account of a deluge from which Ziugiddu, a king and priest (of Shuruppak[?]), is saved. The Creation myth thus serves in this version as an introduction to the description of the Deluge.* In its complete form the tablet (or a preceding one of the series) no doubt contained an account of the conflict between Enlil and the dragon which, we have seen, is the invariable feature of Babylonian creation stories, symbolising the change of seasons from winter to spring.

It is, in fact, because of the strong hold acquired by this ancient tradition of the world coming into existence in the spring as a result of the conquest of winter, that Babylonia and Assyria were pevented from reaching out to a more impressive view of the creation of the world, one that would be marked by an attempt to trace the various steps in an evolutionary process.

To sum up then, the various Babylonian creation stories remain on the level of nature-myths. They contain a variety of interesting pictures as well as thoughts and suggestions which indicate the attempt to rise superior to the myth, but an

* Doctor Poebel is of the opinion that the tablet in question forms one of a series which began with a full account of the creation of the world after the conquest of the dragon by Enlil, then took up the narrative of the great Deluge and passed on in another tablet to a list of kings from the time of the Deluge onward. If this view be correct, we would have in this continuous narrative a parallel to the biblical compilation of narratives of Creation and of the Deluge with chronological lists sandwiched in (Gen. chap. 5). The high figures assigned in Genesis to the lives of the antediluvian patriarchs are again paralleled by the extraordinary lengths assigned to the reign of the earliest Babylonian rulers in the tablet published by Poebel (*ib.*, Nos. 2–4, of vol. VI).

attempt that is, on the whole, weak and completely fails. There is little if anything of a spiritual character in these tales. The gods impress one as majestic and grand, but with decided limitations of character due to the materialistic form in which they are conceived. Even man, though viewed as a special creation of one god or the other, whichever happened to be at the head of the pantheon in the centre in which the version arose, is not endowed with any spiritual powers. True, the blood of the god was given to man, but this gift merely reflects the current view that life comes from the gods and that there is a link uniting man with the higher powers. Man exists for the sake of the gods. Mankind is created to provide worshippers for the gods and to build temples in their honour. That is the characteristic last word of the Babylonian-Assyrian view of man's place in nature.

Turning now to the story of Creation as recounted in the first two chapters of Genesis, we note, in the first place, that, as among the Babylonians, there were several versions current. Two of these, differing considerably from one another in matters of detail, are preserved in the first two chapters of Genesis.* In addition, we have scattered references, in poetical books like Job, in some of the Psalms, in poetical passages embodied in the orations of the Hebrew Prophets, and in the apocalyptic literature† which indicate the existence of a considerable amount of what may be called popular tradition in regard to the creation of the world, and which, it is quite possible, likewise existed in a definite literary form. Since, however, it is evident from internal evidence that the collection known as the Old Testament represents only a portion of the literature produced by the Hebrews in pre-exilic and post-exilic days, there is a strong presumption in favour of the view that the two versions of the Creation preserved for us by no means exhaust the literary material once

* See the analysis in Skinner's or Gunkel's Commentary on Genesis.

† Collected and discussed in Gunkel's *Schöpfung und Chaos*, pp. 29–111 (Göttingen, 1895).

current among the Hebrews in regard to the ever-fascinating subject of Beginnings.

The second version, beginning with the fourth verse of chapter 2 and extending to the end of the chapter, is the briefer of the two and, evidently in the form preserved, assumes the existence of chapter 1, the compiler contending himself with introducing in the second chapter only such features as are not covered in the first. It begins with the statement: "These are the generations of Heaven and Earth as they were created," to which there is added as an explanatory comment: "On the day that Yahweh Elohim made Earth and Heaven." The second part of this verse is apparently attached in order to prepare us for what follows, which is entirely devoted to an account of what happened on earth—the springing up of verdure, vegetation, and the creation of man. Nothing whatever is said about the heavens—presumably for the reason already suggested that in the first version this has been covered, and we may therefore conclude that the second version was in this respect identical with the first. All that we learn therefore from the second version is that the earth, the special creation of which is not indicated, is a desolate waste because not fertilised by rain and because man was not there to cultivate the ground. The point of view, it will be observed, is distinctly agricultural; and this is borne out by the continuation of the story which tells how moisture arose from the earth and soaked or watered the ground and how God created man through dust from the soil and blew into his nostrils the breadth of life. The earth thus becomes the mother of mankind, and the source of all life and vegetation. The earth having been watered, Yahweh Elohim plants a garden to the east of Eden—which appears to be used here for a district in southern Babylonia—and there he places man originally for the purpose of enjoying the fruits of the trees planted by God Himself and without any effort on man's behalf. But in verse 15 we come across a somewhat different tradition, according to which man was placed in the Garden of Eden "to culti-

vate it and to guard it," suggesting a comparison with the account of the creation of man as given by Berosus,* and according to which man is placed here because the earth was barren, there being none to cultivate it. From the same ground from which man is taken Yahweh Elohim creates the animals of the field, and the birds of heaven. It is noticeable that there is no reference in this version to animal life in the waters. The version in fact seems to glide rapidly over the whole work of creation in order to reach the main point of the compiler, which is to set forth his theory of the position of man in nature, and the reason for the conditions of life which he finds, on the whole, to be hard and harsh. On the one hand, man is the lord of creation, as in the first version, and this is symbolised by the privilege accorded to him of giving names to all the animals. There seems to have been still present in the mind of this compiler the old notion that the name was an essential part of the being. He did not go so far as to assume that the one who gave the name was also the creator, but, at least, in supplying the name, he completed Creation itself by the addition of an essential factor. But why, this compiler asks himself, is it that man whose superiority over the rest of creation is thus acknowledged, is himself a hard-working slave, compelled to drudge in order to maintain life—that gift of God, given to him by the Creator Himself? Our compiler is a philosopher who ponders over the problems of existence and whose conclusions are so gloomy in character that he may with some justice be called the father of pessimism. There is, to be sure, a somewhat brighter touch in his account of the creation of woman. He represents man as being lonely and finding no worthy associate among the animals. In the Babylonian epoch of Gilgamesh† there is an interesting account of primitive man actually living with the animals, and it may well be that the compiler of the second

* See above, p. 206.

† Tablet I, 86–91 according to Ungnad-Gressmann's edition of *Das Gilgamesch-Epos.* (Göttingen, 1911).

version had a faint recollection of such a tradition.* He has, however, an exalted view of the superior position occupied by man in nature; hence he introduces the woman for the purpose of securing an associate worthy of man, but the associate alas! helps to bring about man's fall from divine favour.

Interested as the compiler is in all origins, he attaches to the account of the creation of woman the explanation for the marriage tie which binds man and woman to such an extent as to prompt him even to give up parental ties in order to establish a household of his own in association with the woman of his choice. The pessimistic note is unmistakably struck in the third chapter in the remarkable story of the temptation and fall. In addition to the original purport of the story to explain the presence of death in the world, it furnishes for our compiler the medium for explaining why man, originally placed on earth by a beneficent Deity who provided everything for him, is now forced to work in the sweat of his brow throughout his life until, exhausted with toil, he lies down to eternal rest in the ground whence he was taken. Work, according to this writer, is the curse put upon man through disobedience, while the woman's fate is painted in even gloomier colours. She will be under the control of her husband, at the mercy of his pleasure and his passion, and be obliged to endure the throes and pains of childbirth. Work and suffering are to be the fate of mankind. This gloomy and pessimistic outlook is continued in the succeeding chapters, particularly in the account of the Deluge, which is brought on through the growing wickedness of mankind; and even when, after the Deluge, God promises not to bring on another catastrophe, the reason assigned for the resolve is that it is not worth while to curse the entire earth for the sake of man, since "the inclination of his heart is towards evil."† God repents having made man, and therefore encompasses his destruction.

* See an article by the writer on "Adam and Eve in Babylonian Literature," in the *American Journal of Semitic Languages*, vol. XV, pp. 193–214

† Gen. 8:21.

The righteous is saved and a new race created, but without any hope of permanent improvement.

It will be evident from this brief survey that this second version of Creation has few points in common with any of the Babylonian versions discussed. Not only is there no chaos at the beginning of things and no conflict between the lower and higher order, but there is a total absence of any element that might be called mythical. The version, so far as preserved, is a very sober and rather prosaic record of the way in which vegetation arose, why man was created, how the beasts were created and named; and in all this the main purpose of the writer is evidently philosophical and religious, with the story itself merely as a framework. The point of view is of a remarkably advanced type, and it is fair to presume that this account represents the science of the day rather than the remnants of popular tradition. Even the touch which might suggest a more primitive form of thought, according to which man is formed out of the dust of the earth and the breath of life breathed into his nostrils, is primitive only in so far as it assumes the material substance of man to be the same as that found in the earth; and yet the endeavour to trace back all things in and on the earth to the earth itself takes us into a realm of thought considerably removed from naïve and primitive speculation.

The case is quite different when we come to consider the version of Creation in the first chapter of Genesis and extending through the third verse of the second chapter. This account, according to the modern analysis, forms part of a large compilation conveniently known as the Priestly Code, in which in a framework of history and law things are traced back to their beginnings. In its present form the account in the Priestly Code must be later than the second version, and yet in a comparison of the two the second stands on a higher plane of thought and has also a decidedly more rationalistic tinge. The purpose of the compiler or compilers of the Priestly Code in beginning the history of Israel with the creation of the

world was twofold. In the first place, it was prompted by the natural desire to trace history back as far as possible, and, secondly, to show the workings of the great Power of the universe from the beginning of time, indicating through incidental references the special concern of this divine Power for the fate of the Hebrews as the chosen people. In the second version there is no trace of this nationalistic view but the Priestly Code, having as its starting-point the special place assigned to the people of Yahweh in the universe, the origin of the Sabbath as a distinctly Hebrew institution is attached to the work of creation. God Himself institutes the seventh day as a day of rest, and the compiler does not shrink from the anthropomorphic implication in representing the Creator of the universe as resting from his labours precisely as a man might. He is concerned with the justification of the central institution of Judaism.

It may seem strange at first sight, therefore, that this narrative should be the one which contains many points of resemblance to the main type of the Babylonian creation stories. One would have supposed that a compiler so saturated with the monotheistic Jewish spirit would have taken care to remove from his account of Creation all traces that seemed to be non-Jewish in character. That he did not see fit to do so may be taken as a proof of the popularity assumed by the tradition embodied in the first chapter, and also as an indication that the compiler himself could not, or did not wish to cut himself loose from popular traditions, but on the contrary desired to use them in illustration of his conception of divine government. The story of Creation, in other words, becomes in the mind of this compiler a kind of parable, told not so much because it furnishes an account of the successive creative acts, but because it illustrates the manner in which all manifestations of the universe, including life in its various forms, go back to the one cause—the 'Word' of Elohim. This emphasis in the case of each creative act upon the power of the 'Word,' which when uttered brings about the Creation itself, is the

key-note to the chapter. Bearing this in mind, let us proceed to a closer analysis with a view of ascertaining exactly wherein the resemblance to Babylonian Creation myths lies.

At the very beginning of this account we have perhaps the most striking evidence of the ultimate identity of the Hebrew and Babylonian Creation traditions, for in the statement that the earth was Tôhû and Bôhû ("void and waste") and that darkness was over the face of the deep (Tehôm), we have the Hebrew counterpart to the Babylonian description of primeval chaos. At the same time the description furnishes the evidence for the thesis that in the biblical account the mythical element has been reduced to the utmost possible minimum. This is indicated by the use of the terms Tôhû and Bôhû in place of personifications like Apsu and Mummu, and more particularly in the entirely impersonal use of the term "Tehôm" in the sense of "watery deep," as against the personification of the primeval waters as Tiamat, and this despite the fact that the Hebrew version still uses the very same term, "Tehôm," as the Babylonian.*

There are traces elsewhere in the Old Testament that Tehôm was once personified, though the personification became, in the advanced Hebrew thought, merely a poetical metaphor. In the beautiful twenty-eighth chapter of Job, where man's search for wisdom is so impressively described, we read: "But wisdom,—where may she be found, and where is the place of understanding? Man does not know her way and she is not found in the land of the living; Tehôm says, 'She is not in me,' and the sea says, 'Not with me.'" Further on we read: "Abaddon† and death say, 'We have heard a rumor about her: God understands her way and He knows her place.'" Elsewhere, as in the 104th Psalm as well as in the various references to Rahab and the Leviathan and the dragon, partic-

* On the identity of Tehôm and Tiamat, which is an amplified form of *tamtu*, "sea," see Skinner's *Genesis*, p. 16, note 2; or Driver's *Genesis*, p. 28.

† "Destruction," a name for the nether world, where the dead are huddled together.

ularly in Isaiah and Job,* we have the further proof that the Hebrews were well acquainted with the nature-myth in its more primitive form, for such figures as Rahab and Leviathan pictured as huge serpents are merely the reflections, in the form of poetical metaphors, of the original personification of primeval chaos as a period in which monstrous beings were in control.

It is worth while to consider some of these references to the nature-myth which will furnish the point for the thesis here maintained that in the Priestly Code the mythical element was intentionally suppressed or, as it may also be put, the creation of the world by a spiritual Being, universal in scope and acting by the power of His word, being incompatible with the representation of Creation as a mere change in seasons pictured as a conflict against a monster—the symbol of primeval chaos and lawlessness—the natural result would be to retain only that modicum of the old nature-myth essential to the account of the order of Creation. The pictures, however, drawn of primeval monsters in poetical passages in various parts of the Old Testament, and the frequency with which these pictures are introduced, show not only that the Hebrews knew of these nature-myths, but that the one symbolising the change from the rainy to the dry season—applicable to Palestine as well as to the Euphrates Valley, though not in the same degree—had sunk so deep into the popular mind as to leave its traces in the literature of the post-exillic period down across the threshold of our era. When Job, in one of his descriptions† of the divine Power which lay so heavily on him in his unbearable sufferings, exclaims:

> By His power he has quieted the sea,
> With his intelligence shattered Rahab.
> The bolts of heaven are in terror before Him;‡
> His hand has crushed the winding§ serpent,

* See Gunkel, *Schöpfung und Chaos*, pp. 29–111.
† Job 26:12–13.
‡ So the Greek rendering of this line, the Hebrew text of which is corrupt.
§ On this translation, see Gunkel, *Schöpfung und Chaos*, p. 47.

there can be no doubt that the philosophical poet has in mind the picture of a Tiamat, a great monstrous serpent, suggested, as we have seen, by the billows of the agitated sea. Rahab represents one of the names of this monster and the parallelism with "sea" leaves no doubt as to the character of the personification. The lines imply a conflict with Rahab in which God is triumphant. By His power He subdues the monster, just as Marduk vanquishes Tiamat; and we have a further reminder of the Babylonian myth in the reference to the bolts of heaven which, it will be recalled, Marduk attaches to the gates established at either side of the heavenly expanse, and at which he places watchmen as guards. In another speech of Job,* portraying the irresistible force of God's anger, the "helpers of Rahab" are described as "bent" under the divine wrath, a definite indication that among the Hebrews, as among the Babylonians, Rahab-Tiamat was represented as having an army of monsters to assist her, and which Marduk captures after he has overcome Tiamat. Even more explicit is a passage in a late chapter of the post-exillic portion of Isaiah† in the reference to Rahab as a being that belongs to primeval days, to the very beginning of time. Calling upon the people to place their trust in Yahweh as the supreme vanquisher of all foes, however numerous and strong, the Prophet calls upon God Himself to manifest His power as at the time when He overcame Rahab.

> Awake, awake! gird on strength, O arm of Yahweh!
> Awake as in the days of Beginning,‡ the generations of distant times!
> Art not thou the one who didst shatter Rahab, crushing the dragon?

The picture here forms a complete analogy to the Babylonian myth—even to the conception of Rahab as a dragon. Similarly in Psalm 89:11, in a description of Yahweh's power in quieting the billows of the angry sea, the same reference to the conquest of Rahab is introduced as a metaphor; and it is

* Job 9:13.
† Isa. 51:9.
‡ So the literal translation of Hebrew phrase.

only a further and natural step in poetical imagery to apply Rahab to Egypt as is done in Psalm 87:4 and Isa. 30:7* for Egypt, like Babylon with which it is placed in justaposition in the former passage, is a huge monster in comparison with the small and puny Israel, but Yahweh—so poet and Prophet assume—will stand up against Egypt, just as He quelled the uprising of Rahab in primeval days. In the course of time the term loses its original force of a proper name, as Tehôm lost it, and Rahab becomes a poetical synonym for wickedness, violence, and hostility to Yahweh's kingdom of justice and order. It is so used in Psalm 40:5, which is to be rendered as follows:

> Happy the man who makes Yahweh his trust,
> And turns not to the Rahabs† and to lying rebels.

Corresponding to the various names for the monsters associated with primeval chaos that we encounter in the Babylonian myth of Creation—Tiamat, Ummu-khubur, Kingu, besides Apsu and Mummu—due, as has been suggested, to the combination of various versions to form the great Marduk epic—we have in Hebrew poetry, by the side of Rahab, other designations conveying the same picture. Prominent among these is Leviathan, occurring likewise in Psalms, in a prophetical utterance embodied in Isaiah, but which belongs to the post-exillic period,‡ and more particularly in Job.

The 74th Psalm reveals its origin in the Maccabean period —perhaps just before the uprising—in so unmistakable a manner that scholars are practically agreed in assigning it to about 165 B. C. It is, therefore, of special significance to find in so late a production a poetical metaphor introduced which would be unintelligible without the assumption that the imagery is based on a pure nature-myth, and evidently the

* The ordinary rendering of the close of this verse is senseless. By a very simple procedure, Gunkel (p. 39) obtains the reading "the silenced Rahab," *i. e.*, the monster who has been overcome and made harmless.

† The plural form is used—a further indication of the disassociation from its original personification.

‡ Chapter 27. See Duhm's *Iesaias*, p. 165.

same myth that underlies the references to Rahab—a conflict in primeval days between Yahweh and a huge monster. After describing the desolation wrought by the enemy—the Greek supremacy—the defilement of the sanctuary, the burning of synagogues throughout the land, and lamenting the absence of prophets and of signs indicative of any relief, the psalmist appeals to God:*

> Thou, O Yahweh, art my king from of old,
> Working salvation in the midst of the earth.
> Thou hast divided the sea with thy arm,
> Thou has broken the heads of the dragons in the waters.
> Thou hast crushed the heads of Leviathan,
> Gavest him as food for† . . .
> Thou hast split fountain and brook,
> Thou hast dried up the streams of primeval time.
> Thine is the day, aye thine is the night.
> Thou hast fixed the moon and sun,
> Thou hast set all the bounds of the earth.
> Summer and winter thou hast formed.

The entire description is evidently a reminiscence of the work of creation, though the poet avails himself of his licence in deviating somewhat from the conventional order set forth in the first chapter of Genesis. The creation of day and night, the work of the second day, is followed in a logical sequence by the reference to the creation of moon and sun,‡—the work of the fourth day. This in turn leads to an allusion to the limits set to the dry land which forms part of the work of the third day. The reference to the two seasons resulting from the establishment of order and law in the universe reveals the substratum of myth in the description, for it will be recalled that the Creation epic is based on the change from the wintry and rainy to the dry and warm season. We are therefore justified

* Verses 12–17.

† The text is corrupt. The ordinary rendering, "for the people of the wilderness," is without sense.

‡ The precedence of moon over sun reminds us of the order in Babylonian-Assyrian texts, where under the influence of astrological notions the moon-god, Sin, is invariably placed before Shamash, the sun-god. See Jastrow, *Religion Babyloniens und Assyriens*, II, p. 457. Poetic usage follows archaic traditions.

in interpreting verses 13–14 as a reminiscence of the very first work of creation—the conquest of the great monster and of her numerous brood. The dragons in the waters represent the army of Tiamat, while Leviathan—here described as a many-headed Hydra—is clearly synonymous with Tiamat herself. Poetic licence leads the poet to introduce in verse 15 the description of Yahweh's power in causing springs to gush forth, brooks alternately to stream with water and to be dried up.* Isaiah uses the old nature-myth in apocalyptic fashion† to foretell the coming destruction of the enemies of Israel. Leviathan, like Rahab,‡ becomes a symbol of a powerful nation —Egypt, Babylon or Assyria, as the case may be. The myth is introduced as a mere metaphor, and the Prophet, having in mind three powerful enemies, has no scruples in suggesting three monsters instead of one.

"On that day Yahweh will visit with his sword the cruel, the mighty and the powerful,§—Leviathan, the winding‖ serpent, and Leviathan, the twisted serpent, and he shall kill the dragon in the sea."

The winding and the twisted serpent and the dragon in the sea are identical—variant descriptions of the great monster Tiamat.

We must turn, however, to the magnificent fortieth and forty-first chapters of Job to learn the extent to which poetic fancy went among the Hebrews in picturing the primeval monster whom Yahweh alone was able to subdue. To illustrate the weakness of man in contrast with the Deity, and therefore the folly of man to question God's ways,¶ the poet asks: **

* The reference might also be to "the fountains of the deep" (*tehôm*) which, when they are "split open" (Gen. 7:11), cause the destructive Deluge.

† I follow Gunkel's interpretation (*Schöpfung und Chaos*, pp. 45 *seq.*).

‡ Above, pp. 223 *seq.*

§ Corresponding to these three terms we have three serpents—two Leviathans and a dragon.

‖ The same attribute as above, p. 222.

¶ The chapter belongs to the supplementary portion of the book of Job.

** Chapter 40:25–32; in the English version, chapter 41:1–8.

Canst thou draw Leviathan out with a hook?
And with a cord fasten his tongue?
Canst thou put a hook in his nose?
Or bore his jaw with a ring?
Will he make supplication to thee?
Or speak soft words to thee?
Will he make a covenant with thee?
So that thou takest him for a servant forever?
Wilt thou play with him as with a bird?
Or tie him like a dove for a child?*

. . . . . .

Canst thou fill his skin with spears?
Or his head with fish spears?
Just lay thy hand upon him and thou wilt not think of a battle (with him) again!

Yahweh alone can deal with Leviathan. He can overcome him—catch him as one hooks a fish, use him as a toy,† as one plays with a pet bird. All this is poetic fancy, but the nature-myth runs through the lines and is manifest in the reference to Leviathan's appeal for mercy to the powerful Yahweh who has captured him, as Marduk caught Tiamat and made her subservient to his wishes. The further description of the monster, strong of fangs (41: 6), raising himself up to a great height (41: 17), to whom iron is as straw (41: 19), suggests in various ways the description of the brood of monsters who constitute the army of Tiamat, though touches are added, such as the flames issuing from his mouth (41: 12–13), which appear to be original creations of the Hebrew poet who allows his fancy free flight. In the description of the huge monster Behemoth in chpater 40, though the poet probably has in mind the hippopotamus, there are allusions which suggest an association with Leviathan; and it may be that Behemoth is also a designation for the primeval dragon, symbolising the chaos at the beginning of time. The huge size of both Leviathan and Behemoth reminds one of the description of the dragon in

* I follow Gunkel's (p. 50, note 2) ingenious and simple emendation of the text.

† *Cf.* Psalm 104:26, "Leviathan whom thou hast formed as a plaything"—so the correct rendering.

one of the Babylonian versions above discussed.* Be this as it may, enough evidence has been brought forward to show that up to a late period the Hebrews were perfectly familiar with the old nature-myth of the conflict with the monster Tiamat, or whatever name we choose to apply to it; and it is also a justifiable conclusion that what has become a metaphor in Hebrew poetry was once popularly regarded as an actual occurrence, to account for the existence of law and order in the world in place of primeval chaos and lawlessness.

Coming back now after this somewhat long digression to the first chapter in Genesis, we find that here even the metaphor has disappeared as incompatible with an account of Creation by a purely spiritual Power, whose word alone suffices to bring about the desired result. No conflict is required. Indeed, the suggestion of a conflict would mark a limitation to the supreme majesty of the divine command. Hence the addition to the description of primeval chaos, in the second verse of the first chapter, of the words "and the spirit of Elohim brooded over the face of the waters," which dispose briefly but effectively of the entire conception of any conflict at the beginning of time. In place of the conflict we have the picture of the divine afflatus hovering over the watery mass. We need not stop in an attempt to specify the picture that the compiler had in mind. The vagueness is inherent, the evident aim being to remove all traces of any materialistic conceptions of divine Power. The limitations of human language are particularly apparent when we endeavor to describe the beginning of things, but it is difficult to imagine a more profound and at the same time a more sublime description of such a beginning than is suggested in the simple phrase, "The spirit of Elohim brooded over the face of the waters." Throughout the chapter, in accordance with this high plane of spiritualised religious thought, the source of all creation is concentrated in the divine command. The Deity in the Hebrew story is not an artificer who by a process of work gradually brings things into being;

* Above, p. 212.

He is one whose word immediately produces the result. *Fiat lux!* God said—"Light be, and light was."

In this creation of light as the result of the first utterance of God we may, I think, see a direct protest against the Babylonian version which makes some particular personification of nature—the water-god, Ea; the storm-god, Enlil; or, in the latest version, Marduk, the sun-god—the creator of everything. The sun being recognised throughout antiquity as the source of light, Marduk himself is the light. The Hebrew poet, reflecting the view of the Prophets to whom God is the supreme spiritual power rising above the universe, makes the light a part of His Creation. *Fiat lux* represents the protest against the assumption that a power which itself represents the light can be the source of being. There is One superior even to the light by whom light must be first created. We find a trace again of earlier conceptions, recalling the description of Marduk's making a covering out of one side of Tiamat stretched across the heavens to prevent the upper waters from flowing out, in the biblical description of an expanse (*rekîa'*) to separate the waters below from the stars above. The expanse, which evidently is still conceived as a material substance, is called "heaven." Similarly, we have another direct trace of the common origin of the Hebrew and Babylonian traditions in the conception that the gathering of the waters below the heavens to one place reveals the dry land. The earth is therefore assumed as in existence, merely submerged through the waters abounding everywhere. When, therefore, we read, "Elohim said, Let the waters under the heaven be gathered to one place so that the dry land may appear, and it was so," we must admit the parallelism with one of the versions of the Babylonian stories, in which it will be recalled the gathering of the waters into a channel results in the appearance of terra firma.*

The vegetation of the earth follows in the biblical account as a natural consequence of the gathering of the waters. The

* Above, p. 208.

thought is here, as I have already indicated, on a higher plane than that which we find in the second chapter according to which the earth existed in a barren state until it was soaked through moisture and until man came to cultivate it.

In the account of the creation of the great bodies in the heavens, the sun and moon, and to which a later commentator added the stars, we have a most suggestive parallel with Marduk's regulation of the movements of the heavenly bodies after his victory over Tiamat, and of which we have encountered a reminiscence in a description of the conflict with the Leviathan.* As in the Babylonian account, the purpose of the lights in the heavens is to regulate time and seasons, or, in other words, to furnish a basis for the calendar. But whereas in the Babylonian version we find the moon placed in supreme control, time being calculated according to its phases, in the biblical version emphasis is laid upon the two lights, the greater one for the control of day, and the lesser one for the control of night. The circumstance that Marduk was in reality a personification of the sun necessarily hampered the Babylonian priests in their endeavor to explain the existence of movements in the heavens. Under the sway of astral theology the moon, planets, and stars constituted the main occupants of the heavens, and, as a matter of fact, in the astrological texts of the Babylonian and Assyrian priests the moon and planets play a very much more important part than the sun, which is invariably, in any enumeration, placed after the moon.† The Hebrew compilers, freed from the shackles of astral conceptions of the universe, and assuming at the head of the universe a spiritual power superior to the sun and to the light of which the sun is regarded as a symbol, placed sun and moon precisely in the same category. It may be that in the term "as signs" (verse 14), in connection with sun and moon, there is a trace of the observance of the heavenly bodies to

* Above, pp. 226 *seq.*

† See Jastrow, *Religion Babyloniens und Assyriens*, II. p. 457. See a trace of the same order in Hebrew usage; above, p. 225, note 2.

obtain "omens," which would point to the influence of the astral theology of Babylonia and Assyria, but through the addition of "and for seasons, days and years" the calendrical purpose served by the sun and moon is emphasised—perhaps with intent to remove the possible implication of astrology in the use of the two heavenly bodies as "signs."

The question has often been asked, Is there not a strange inconsistency in the biblical story in assuming the creation of light at the very beginning of time as the work of the first day, whereas the sun is not called into being until the fourth day? The question, it seems to me, is an idle one and misses the point of the biblical poem. No doubt the compilers of Genesis knew as well as we do that the illumination of the earth is due to the sun; common experience would have been sufficient to have made this self-evident. In describing the work of the fourth day, the aim is rather to specify the position accorded to the sun in the regulation of material phenomena. Standing under the influence of the popular tradition, which assumed the purpose of the heavenly bodies to be the regulation of the calendar, the paragraphs about the moon are retained, but consistent with the higher conception which makes both sun and moon the products of the one Power presiding over the universe, the older form of the tradition is essentially modified.

The creation of animals follows, and it is interesting to note the order in creation: first, the life in the waters and then the birds flying over the earth across the expanse of the heavens. There are further specifications regarding these two classes of animals, but the creation of land animals is not mentioned until the work of the sixth day. It is doubtful whether in the mind of the compiler any special significance was attached to this division in the creation of animals or whether he laid any stress on the order—water animals, air animals, and land animals. So far no parallel to this order has been encountered in any of the Babylonian and Assyrian versions, though it is, of course, possible that one may yet be found. The order follows perhaps a logical sequence. Since water and the

atmosphere above the waters are supposed to be in existence earlier than the land, the animals of the water and of the air are mentioned first. It is, however, of importance to note that among the life that swarms in the waters, "the great dragons" are singled out for special mention. The word used for dragons* is identical with the term occurring in the poetical allusions to the nature-myth of the conflict between Yahweh and the great primeval monster, pictured as a dragon and accompanied by an army of dragons.† The introduction of the term is hardly accidental, and I have no hesitation in recognising in the specific mention of the "great dragons" as the creation of Yahweh, a further protest against the nature-myth which assumed the great dragons, including their leader Tiamat or Rahab or Leviathan, as pre-existent. This is again, therefore, a deliberate effort to expunge the mythical element which we have seen to be one of the characteristic aims of the Creation version in the Priestly Code.

So far, then, we have encountered plenty of traces of the existence among the Hebrews of the same nature-myth as is revealed in the various Babylonian versions to account for the creation of the world, but with the unmistakable tendency in the biblical versions to remove the mythical aspects and to minimize this element of myth when it cannot be entirely eliminated. The wide departure from Babylonian traditions is, however, particularly apparent in the spirit of the transformed Hebrew tradition which changes the Creator from a vanquisher of hostile forces, and from an artificer after the fashion of a human workman, into a spiritual Power, acting by His 'Word' alone. The Word brings about light, the Word causes the dry land to appear and clothes the fields with verdure, the Word brings forth trees and plants, and fills water, air and land with living beings. This 'Word of Yahweh' is frequently introduced in the Prophets and Psalms to describe not merely the power but the very essence of the

* *Tanninim*, plural of *tannin*.
† Above, p. 223.

Deity, conceived as a universal Being and pictured as a spiritual force. To be sure, in Babylonian and Assyrian hymns the 'word' of Enlil, of Marduk, of Ea, of Shamash, and so through the list of the chief gods of the pantheon, also plays a prominent part. Compositions bewailing some great catastrophe that has overtaken the land describe the power residing in the word of a god, which causes heaven and earth to tremble and spreads terror on all sides:

> The word that causes the heavens on high to tremble,
> The word that makes the earth below to quake,
> The word that brings destruction to the Anunnaki,*
> His word is beyond diviner and seer,
> His word is a tempest without a rival.†

The conception, however, remains on a materialistic basis, and when applied to other than storm-gods whose 'word' is the thunder, it is the actual strength and power of the god that is meant. We have a trace of this conception of the word in poetical metaphors occurring in Psalms such as the twenty-ninth:

> The voice of Yahweh is upon the waters,
> The God of glory thundereth.
> . . . . . .
> The voice of Yahweh is full of power,
> The voice of Yahweh is full of might.
> . . . . . .
> The voice of Yahweh hews flames of fire,
> The voice of Yahweh shakes the wilderness,

but the higher point of view, marking the departure from the Babylonian conception, finds an expression in the scene of Elijah on the mount‡ where a strong wind, a violent earthquake and fire passed before the Prophet. Yahweh was not in the storm, or in the earthquake, or in the fire, but mani-

* Above, p. 210, note.

† See many other illustrations in Jastrow, *Religion Babyloniens und Assyrians*, II, pp. 26 *seq.*, and Zimmern in *Der Alte Orient*, XIII, 1 pp. 21–27.

‡ I Kings 19:11–12.

fested Himself in the "still, small voice"—a decided contrast, therefore, to the "voice of Yahweh" in the Psalm from which we have quoted. The "thin, small voice" illustrates the endeavour to spiritualise the power of Yahweh, an endeavour that finds its full expression in the Word of the Deity as conceived by the Prophets, and of which the Word that creates the light, the heavenly bodies and the earth and all there is in it, is a direct reflection. The 'Word' of God in the development of Hebrew religious thought becomes more than a mere phrase or a metaphor; it shows a tendency to become *personified*, as though it had an independent being, though at the same time always identical with the divine Power Himself. When in the famous eighth chapter of the book of Proverbs, celebrating the power of wisdom, Wisdom is similarly personified (verse 23):

> Yahweh acquired me [*i. e.*, Wisdom] at the beginning of his way,
> before his works of primeval days.
> I was set up from the very beginning of the earth when there
> were no deeps,*
> I was produced when there were no fountains,†
> I was in honor‡ before the mountains were settled,
> Before the hills I was produced,
> Before yet he had made the earth.
> When he established the heavens, I was there,
> When he fixed a circle around the face of the deep.§
> . . . . . .
> When he gave a bound to the sea,
> Beyond which its waters were not to pass;
> When he appointed the foundations of the earth,
> I was by him constantly,
> His daily delight,
> Rejoicing before him at all times,

it is clear that wisdom is here used almost as a synonym for the divine 'Word,' which naturally is the 'word' of Wisdom.

* *Tehómót*, the plural of *tehóm*, originally the personification of the deep, as we have seen.

† The fountains of the deep which feed the streams and rivers. See the illustration, Fig. 1, in Schiaparelli's *Astronomy in the Old Testament*.

‡ Conjectural emendation of the Hebrew text, suggested by the parallelism.

§ *Tehóm*, as above.

The description given of Creation may be regarded as a poetical paraphrase of the account of Creation in Genesis. It is based on this account, and Wisdom thus associated with every phase of the work of creation, existing even before primeval chaos, is the spirit of God Himself "brooding over the waters," as well as the divine 'Word' through which everything is created. The three terms, God, Word, and Wisdom, are almost identical. Word and Wisdom become theological concepts, endeavours to picture the workings of a Power conceived entirely as a spiritual force. This personification of wisdom as the companion of God in the work of creation, the medium through which the Divine transforms His desires into actions, is reflected in the twenty-eighth chapter of Job* to which a reference has already been made. After describing the hopeless search of man for wisdom—not to be found in the sea nor in the depths nor in the hidden recesses of the mountains to which man penetrates in search of gold and precious stones—the poet in a sublime height of rapture exclaims:

When he fixed a bound to the rain,
And a path for the flash of the thunder,
Then he saw and celebrated her.
He established and searched her out,
And said to man:
"Behold the fear of the Lord is Wisdom†
Removing from evil—Understanding."

Concomitant, therefore, with the minimising of myth in the development of Hebrew views of Creation, we have the process which leads to the personification of the 'Word' of God—more specifically pictured as 'Wisdom'—as the associate of the Deity in the work of creation. The further growth of this

* Above, p. 221. The chapter has no connection with the book of Job, and is only loosely related to the problem with which the book deals. It is an independent composition, a fragment perhaps of a larger disquisition on wisdom, closely allied to the eighth and ninth chapters of Proverbs. We must, however, be grateful to the editor who inserted the chapter on Job, and thus preserved for us one of the gems of ancient Hebrew literature.

† Evidently a paraphrase of Prov. 9:10:

"The fear of the Lord is the beginning of wisdom,
And the knowledge of the Holy—understanding."

personification of the Word or of divine Wisdom leads to the famous doctrine of the *Logos* or 'Word' as set forth in the writings of Philo of Alexandria and which finds its reflection in the opening words of the Gospel of John which so succinctly and admirably sum up the entire process of thought involved:

> In the beginning was the Word and the Word was with God and the Word was God.

A comparison with the chapter from Proverbs, from which we have quoted, shows the identity of the 'Word' and 'Wisdom,' for Wisdom (like the 'Word') was in the beginning; she was "with God" and, as we have seen, was not to be distinguished from God. God, Word, and Wisdom are three in one. We thus have, under the influence of the higher conception of divine government of the universe as voiced in the utterances of the Hebrew Prophets, the transformation of the 'Word' of power and strength—such as the 'word' of the Babylonian and Assyrian gods is, and as the 'Word' of Yahweh at an earlier stage of the Hebrew religion was—to the 'Word' of wisdom, the 'Word' that is 'Wisdom'; and along with this transformation the personification of the Word, suggested in the Genesis account of Creation and receiving its theological formula in John's definition of the *Logos*.

The minimising of myth—practically to the extent of a complete elimination—and the enthronement of the divine command, leading by a natural process to the personification of the 'Word' of God, are the two features in the account of the five days of Creation that suffice to show the wide and complete departure of Hebrew traditions from their Babylonian counterparts; and it will, I think, be admitted that the departure is of more significance than the fact of the common possession of a nature-myth with which both Hebrews and Babylonians started out and which is still apparent in the account in Genesis despite its complete transformation.

It is in the work of the sixth day, however, that the biblical narrative rises to its greatest height, in its account of the

creation of man endowed from the very beginning with the spirit of the divine Creator. A greater contrast between the statement in the impressive Hebrew narrative of the creation of man in the image of God, as against the Babylonian view of man's being created for the sake of the gods, to provide temples and worshippers for them, can hardly be imagined. The difference between the two points of view represents the wide gap between the materialistic conception of the gods as powers of nature, who by virtue of their power exercise control and who in return demand homage and tribute just as an earthly ruler does, as the means of securing favour and grace, and on the other hand the conception of a Power expressed in spiritual terms who is the ultimate source of all life and who gives to man his special place in nature by imbuing him with an element directly taken from the divine source of all life.

In the somewhat modified form given by Berosus of the creation of both man and animals through the mixture of the earth with the blood of the god Bel,* who had asked one of the gods to cut off his head, there is, to be sure—as has been pointed out†—a suggestion of the thought that human life, as also animal life, contains the same essence as that attributed to the gods, but the suggestion stops with the very primitive notions associated with blood as the source of life. The Babylonians were unable to conceive of life, as manifested in man and in animals, without blood, and accordingly this conception of blood as the essence of life was transferred to the gods.

In the second biblical version there is still a trace of the earlier materialism in the manner in which Yahweh Elohim is represented as taking the dust of the ground and breathing the breath of life into the nostrils, in consequence of which man became "a living soul." It is hardly open to question that in the narrative of the first chapter of Genesis all traces of any

* *I. e.*, as will be recalled, originally the god Enlil, of Nippur, whose traits are transferred to Marduk, who becomes the "Bel," or "lord," of the Babylonian pantheon.

† Above, p. 206.

materialistic aspect have been *intentionally* removed, or, as we ought rather to put it, the religious thought reflected in this chapter has advanced to such a point as instinctively to revolt against the merest suggestion of the divine Power of the universe working after the manner of man, just as the entire narrative endeavours to avoid any suggestion of an anthropomorphic conception of the Deity. It was not necessary for the compiler to specify or even to make perfectly clear to himself what he meant by the phrase "in the image of God," any more than it was necessary or perhaps possible definitely to indicate the thought in mind in describing the spirit of Elohim as "brooding over the face of the waters." What he wishes to bring out is the special position occupied by man in the world and to account for man's wonderful power in making nature subservient to him, in successfully combating the hostile elements of nature, in rearing great civilisations—to account for his achievements in art and literature, in government and in thought. The aim of the compiler was to explain all this through the infusion of the divine spirit into man at the time of the creation of the first human pair. "The image of God" was chosen as the most appropriate phrase to express the idea that there was reflected in man the spirit of the divine, just as the "Word" of God, or "Wisdom," came to be chosen as the term to convey a picture of divine action.

To sum up, therefore: the biblical narratives of Creation in both versions that have come down to us reflect the advanced stage to which Hebrew thought was brought through the rise of ethical monotheism, and represent in consequence a wide departure from Babylonian traditions, which even in their most developed and latest form remain on the level of nature-myths and are clogged through the materialistic view taken of the powers of the gods. The points of resemblance between the Hebrew and the Babylonian traditions of Creation indicate that Hebrew thought at one time occupied the same level as that on which Babylonian civilization, even at its climax, continued to stand. Accepting these points of resemblance as

indications that Hebrew and Babylonian traditions revert to a common source, and that through the direct contact between the two peoples at an early period even the shape taken by the tradition in Babylonia influenced in a considerable measure the Hebrew forms of the narrative, we are, it seems to me, by virtue of this admission, in a far better position to estimate at its real and full value the sublime height to which particularly the biblical version in the first chapter of Genesis rises. To treat this version in cold, prosaic fashion as a quasi-scientific story of evolution is to close our eyes to its beauty as a poetic production and to the depths of religious and ethical thought which it reveals. I have no sympathy with the efforts to force the order of Creation in the biblical narrative into accord with the results and dicta of modern science. Such attempts necessarily involve forcing the phraseology of the Hebrew original and reading views into the text for which there is no warrant; and even then the attempt fails. In my opinion, it is an injustice to the aim and spirit of the narrative to look at it from the point of view of modern science. It is a religious document, an ethical parable; and science is *not* religion. In its proper setting, the biblical narrative conveys a picture of a spiritual Power presiding over the government of the universe —one that for poetic impressiveness and depth of religious thought maintains its unique place. We must look upon the narrative as an expression of the peculiar type of monotheism, saturated with ethical ideals, which resulted from the teachings of the Prophets. Our thought should be directed to the picture of the one great Power bringing the universe into being by His Word and placing in nature, as the crowning point of Creation, man imbued with a portion of the same divine spirit. Viewed in this light, such questions as are sometimes raised as to the significance of the six days of Creation appear trivial, and the attempt to convert the six days into periods trite. We ought to recognise once for all that the creation of the world in six days, or even six periods, rests on views that are not compatible with modern geology and biology, which start

from entirely different points of view. The six days have no more real significance than the seven tablets which comprise the main Babylonian version of Creation. By adding to the six days the seventh as the day of rest, we obtain a complete correspondence in numbers between the Hebrew and the Babylonian narrative, and we have plenty of evidence to show that Hebrews and Babylonians shared the view which gave to the number seven a sacred significance.* It is, however, of importance to note that, in place of a seventh day corresponding to the seventh tablet in the main Babylonian version, we have attached to the biblical narrative, as its symbol of the sacredness of the number seven, the institution of a day of rest, to be celebrated every seventh day, and which constitutes one of the chief contributions of the Hebrews to the religious treasury of mankind. In the opening verses of the second chapter of Genesis this institution is directly carried back to the example set by the Deity in sanctifying the seventh day as one set apart from the balance of the week. The manifest purpose in thus attaching the Sabbath to the work of creation is to justify the importance that it acquired in the religious life of the Hebrews, more particularly in the post-exillic period.

The significance of the Sabbath itself, and the reason why it rose to such importance, together with the consideration of a possible relationship to a corresponding Babylonian institution, will form the subject of the next chapter.

* See Hehn, *Siebenzahl und Sabbat*, for many illustrations among both peoples.

THE MONROE DOCTRINE AND AMERICAN FOREIGN POLICY

By Professor L. S. Rowe
Professor of Political Science, University of Pennsylvania

Some time ago in conversation with a foreign student of American institutions I was asked:

"Does the Monroe Doctrine epitomize the entire foreign policy of the United States? Have you added nothing to, nor subtracted anything from the principles advanced by President Monroe in 1823? Is it possible that the United States has been able to develop from an insignificant factor in world politics to a dominant position in international affairs without changing either the form or the content of her foreign policy? Furthermore, when I inquire into the principles embodied in the Monroe Doctrine, I am given a different answer by every commentator, and am now laboring under the impression that whatever the United States wants to do in her relations with the countries of the American continent is justified by an appeal to the Monroe Doctrine."

These questions and comments bring sharply to mind the extraordinary fact that we have attempted to make a doctrine formulated in 1823 fulfill the purposes and meet the requirements of a great world power.

The fact that the Monroe Doctrine has been given such diverse interpretation by different administrations, and the further fact that it has aroused the opposition of many of the countries for whose benefit it was originally promulgated, make it a matter of more than theoretical importance to inquire whether conditions have so changed that the doctrine formulated in 1823 is no longer applicable to the international relations of 1914. The importance of this inquiry is all the greater because of the fact that during the last few years the Monroe Doctrine has been the subject of repeated attack by men whose opinions are entitled to great weight.

The people of the United States have been warned that the maintenance of the doctrine in its present form would finally result in uniting against them, not only the countries of Europe, but all the countries of Central and South America, and that they would, therefore, soon find themselves in that condition of "isolation" which would have none of the "splendid" characteristics that once marked Great Britain's position amongst the nations.

Let me at this point call your attention to a special circumstance, which may at first glance seem paradoxical. I have already referred to the growing opposition to the Monroe Doctrine in the countries of Central and South America—an opposition dictated by the fact that the doctrine has come to be regarded by them as a menace to their sovereignty and a reflection on their national dignity. Contemporaneous with this growing opposition of the countries for whose benefit the doctrine was formulated, there is noticeable a marked decline in the feeling of opposition to it on the part of the countries of Europe, against which the doctrine was originally directed. In order to account for this seemingly anomalous situation it is necessary to examine briefly the conditions which led to the promulgation of the doctrine, and the purpose which it was intended to accomplish.

The revolutionary movement in South America, which began during the early years of the nineteenth century, was looked upon with profound distrust by the countries of Continental Europe. The establishment of constitutional government in Spain brought matters to a climax and led the Holy Alliance to adopt a plan, the main purpose of which was to vindicate the principle of "legitimacy." The monarchy was to be restored in Spain, and the Alliance then proposed to bring the recalcitrant Spanish-American colonies to terms by restoring them to the mother country. Great Britain, for reasons totally different from those which actuated the Government of the United States, was opposed to the restoration of the colonies to Spain, because she was aware of the fact that such

restoration meant the continuation of an exclusive commercial policy which debarred British commerce from the rich possibilities which the former Spanish colonies offered.

The fact that Great Britain made the first official proposal for a joint declaration against any effort of the continental powers to restore to Spain dominion over her former colonies has created the impression in some quarters that the Monroe Doctrine was in reality of British origin and that the then Secretary of State of the United States, John Quincy Adams, had stolen a march on the British prime minister, and had appropriated to exclusively American use a principle for which Great Britain was prepared to contend with quite the same ardor and enthusiasm as the United States.

The fundamentally erroneous nature of this view can best be appreciated after an examination of the exact content of the doctrine, its purpose and the spirit in which it was received by the countries of Continental Europe. The doctrine is contained in President Monroe's message of December 2, 1823. Two different portions of the message deal with what we now designate as the Monroe Doctrine, corresponding to two distinct international problems which confronted the country at that time.

The ukase of the Czar of Russia of 1821 had set up claims to the northwest coast of America, claiming territory as far south as the fifty-first degree of latitude. This claim was immediately contested by the United States, partly on the ground of rights emanating from discovery and occupation, and partly founded on our treaty of 1819 with Spain. One portion of the message of 1823 was intended to answer this contention in the form of a public declaration which, while issued to the world at large, was especially directed against Russia. This portion of the message read as follows:

"The occasion has been judged proper for asserting, as a principle in which the rights and interests of the United States are involved, that the American continents, by the free and independent condition which they have assumed and maintain,

are henceforth not to be considered as subjects for future colonization by any European power."

It is interesting to note that this declaration was sufficient to lead Russia to recede from her position and to settle the question then pending by the Treaty of 1824.

The second international situation which the President's message was intended to meet arose directly from the proposed attempt on the part of the Holy Alliance, to wit, Russia, Prussia and Austria, to restore Spanish dominion over the revolted colonies. In the hope of checking this movement, President Monroe, at the instance of the then Secretary of State, John Quincy Adams, inserted the following declaration:

"We owe it, therefore, to candor and to the amicable relations existing between the United States and those powers (the allied powers of Europe), to declare that we should consider any attempt on their part to extend their system to any portion of this hemisphere as dangerous to our peace and safety. With the existing colonies or dependencies of any European power, we have not interfered and shall not interfere. But with the governments who have declared their independence and maintained it, and whose independence we have, on great consideration and on just principles, acknowledged, we could not view any interposition for the purpose of oppressing them or controlling in any other manner their destiny, by any European power, in any other light than as the manifestation of an unfriendly disposition towards the United States. . . .

"Our policy in regard to Europe, which was adopted at an early stage of the wars which have so long agitated that quarter of the globe, nevertheless remains the same, which is, not to interfere in the internal concerns of any of its powers; to consider the government *de facto* as the legitimate government for us, to cultivate friendly relations with it, and to preserve those relations by a frank, firm and manly policy, meeting, in all instances, the just claims of every power, submitting to injuries from none. But in regard to those continents, circumstances are eminently and conspicuously different. It is impossible

that the allied powers should extend their political system to any portion of either continent without endangering our peace and happiness; nor can anyone believe that our southern brethren, if left to themselves, would adopt it of their own accord. It is equally impossible, therefore, that we should behold such interposition, in any form, with indifference."

The announcement of President Monroe was received with mixed emotions both in England and in the countries of Continental Europe. One would suppose that the proposal for a joint declaration against the armed intervention of the Holy Alliance having been made by Great Britain, she would have welcomed the declaration. We find, however, that Canning, the British prime minister, while welcoming the announcement against intervention, seriously objected to that portion of the declaration which gave notice that the American continents are not to be considered subjects for future colonization by any European power. He stated that he could not "acknowledge the right of any power to proclaim such a principle, much less to bind other countries to the observance of it. If we were to be repelled from the shores of America, it would not matter to us whether that repulsion were effected by the ukase of Russia excluding us from the sea or by the new doctrine of the President prohibiting us from the land. But we cannot yield obedience to either."

It thus became evident that the British government was actuated by the desire to break up the exclusive monopolistic colonial system of Spain, rather than by any enthusiasm for the establishment and maintenance of independent republics in America. In fact, when Mr. Rush, our minister to Great Britain, indicated to the British prime minister that he would favor a joint declaration against the intervention of the Holy Alliance, provided Great Britain would recognize the independence of the revolted colonies, Canning refused to accept this condition. It soon developed that he was anxious to see the establishment of monarchies in South America to offset the influence of the new republics.

"I have no objection," he said, "to monarchy in Mexico—quite otherwise . . . even in the person of a Spanish Infanta! Monarchy in Mexico and monarchy in Brazil would cure the evils of universal democracy."

Throughout the chancellories of Continental Europe, not excepting France, the declaration of President Monroe aroused great opposition.

The French Minister of Foreign Affairs, Viscount Chateaubriand, stated "that a declaration of the principles upon which the President affects to pronounce how the whole of the New World shall in future be governed, made at a time when the American government is wholly unable to enforce such pretensions, ought to be resisted by all the powers possessing either territorial or commercial interests in that hemisphere, and more especially by Great Britain and France, inasmuch as it strikes at the principle of mediation brought forward by them both, by peremptorily deciding the question of South American independence, without listening to the concessions which either of the parties at issue might be disposed to admit."

Metternich, in Austria, declared that the President's address "had confirmed him in an opinion he had before entertained, that great calamities would be brought upon Europe by the establishment of these vast republics in the New World, in addition to the power of the United States, of whose views no man could entertain a doubt after reading the speech in question."

He held it to be "impossible that any of the European powers could be of opinion (their commercial interests being secured) that the independence of America could be desirable, although circumstances might compel them to acquiesce in it."

There is, however, an interesting discrepancy between the attitude of the English and French cabinets as contrasted with the feelings of the people of Great Britain and France. The declaration of President Monroe was received with much enthusiasm by a considerable section of the population of both

countries. The sentiment in favor of civil and political liberty and the enthusiasm for democratic institutions were constantly gathering strength in Great Britain, and while temporarily obscured, had not been checked in France. We find, therefore, the leading British and French newspapers unstinted in their praise, not only of the wisdom of the declaration, but also manifesting a real enthusiasm for the support which it gave to the liberties of the republics of the American continent. Even in that remote period, far-seeing statesmen such as Canning and Metternich realized that one of the dangers involved in the doctrine was that it led logically to the hegemony of the United States on the American continent: a situation which to their minds was fraught with much danger to European interests. It is also interesting to know that as soon as Monroe's message became known in Europe, speculation began as to the precise scope and limits of the policy thus formulated.

Throughout the countries of Latin America the doctrine was received with unalloyed enthusiasm, and was regarded as an expression of the lofty purpose of American diplomacy. The enthusiasm throughout the United States was, if anything, greater than that which prevailed in the countries of Central and South America. The doctrine appealed to that idealism and spirit of service of the people of the United States which are distinguishing characteristics of our national character. It is safe to say that no thought of national aggrandizement or even of national interest entered into the minds of the people in their unquestioned support of President Monroe.

Here again we find a gap between the sentiment and the feelings of the mass of the people of the United States and the motives which actuated the leading statesmen of the period. There is no doubt that they shared the enthusiasm of the nation for the maintenance and extension of republican institutions, but they were also moved by considerations which while no less lofty were more closely associated with the special national interests of the United States.

The statesmen of the formative period of our national life

were keenly alive to the dangers involved to our national development in the rivalries of European powers on the American continent. These rivalries had been the cause of repeated conflict in our early history, and it soon became clear that our unhampered national development required the emancipation of the northern half of the American continent from European rivalries. This principle of national protection and national self-preservation found expression in Washington's Farewell Address:

"Europe has a set of primary interests, which to us have none, or a very remote relation. Hence she must be engaged in frequent controversies, the causes of which are essentially foreign to our concerns. . . . Our detached and distant situation invites and enables us to pursue a different course. If we remain one people, under an efficient government, the period is not far off when we may defy material injury from external annoyance; when we may take such an attitude as will cause the neutrality we may at any time resolve upon, to be scrupulously respected; when belligerent nations, under the impossibility of making acquisitions upon us, will not lightly hazard giving us provocation."*

In 1808 Thomas Jefferson formulated the same thought in writing to the Governor of the territory of Orleans:

"We shall be satisfied to see Cuba and Mexico remain in their present dependence; but very unwilling to see them in that of either France or England, politically or commercially. We consider their interests and ours as the same, and the object of both must be to exclude all European influence from this hemisphere."*

In short, the principles embodied in Monroe's message of December 2, 1823, far from being new and startling principles of American policy, were but the expression, in somewhat modified form, of national principles which had received sanction from the earliest period of our national existence and which, therefore, represented a traditional policy deemed as essential

* Richardson's Messages, 222.

to our national welfare as the doctrine of the "Balance of Power" was deemed essential to the welfare of the countries of Continental Europe.

The historical circumstances attending the formulation and promulgation of the Monroe Doctrine are so clear and in such complete accord with the manifest requirements of our own national development, as well as with the requirements and, in fact, the very existence of the republics of Central and South America, that it is not surprising to find a harmonious chorus of approval from our Canadian border to the extreme limits of the Southern Continent, and this chorus of approval is coincident with what is known as the era of good feeling in American history, during which it seemed as if party feeling was about to disappear and the unanimous support of the American people was to be given to the government at Washington.

With the formulation of the doctrine in 1823 we leave this era of good feeling and enter upon a period of stress and strife in American politics, during which the doctrine is applied to new conditions, and in which there is evident a spirit of questioning on the part of an increasing percentage of the population as to whether political conditions have not so changed as to make the principles formulated by Monroe obsolete or, as Lord Salisbury put it,

> inapplicable to the state of things in which we live at the present day.

As we have seen, the principles of the Monroe Doctrine do not represent innovations in the foreign policy of the United States, these principles being embodied in the earliest expressions of opinion of the leading statesmen of the United States with reference to the course which should be pursued regarding American affairs.

The recent movement, which had for its purpose the abandonment of the Monroe Doctrine, is based upon the following contentions:

1. That the conditions which justified the formulation of the Monroe Doctrine in 1823 have so changed that these principles

are no longer applicable to modern conditions. The advance of constitutional government it is contended has brought the political institutions of Europe into closer relation with those of America, so that today individual liberty and personal rights are more completely guaranteed in most of the countries of Europe than in many parts of the American Continent. The contrast between European and American institutions can no longer be made the basis of the foreign policy of the United States. The Monroe Doctrine, as a means of protecting free institutions on the American continent, has therefore lost its reason for existence.

2. That the interpretations of the doctrine, subsequent to its original formulation in 1823, have gone far beyond the original intent, and that under the guise of the doctrine we are gradually approaching the point of assuring the paramountcy and the hegemony of the United States on the American continent.

3. That these extensions of the doctrine have aroused the opposition of the countries for whose benefit the doctrine was originally formulated, and that many of the countries of Central and South America are at the present time opposed to the doctrine. In fact, the feeling against the doctrine is more pronounced in Central and South America than in the countries of Continental Europe.

Finally. That the continued maintenance of the doctrine will gradually place us in a position of complete isolation. Although European governments have seemingly acquiesced in the doctrine, it must not be supposed that they regard it with a friendly eye. The continued assertion of the doctrine will, we are told, alienate the sympathies of all the countries of the American continent as well as the countries of Continental Europe.

If these contentions are true, they constitute a serious indictment. In order to reach any conclusion on the subject, it is necessary to bear in mind just what the Monroe Doctrine is, and the main purpose which it was intended to accomplish. It

is important, therefore, to recall the fact that in its original form it was a declaration against further European colonization and against any attempt on the part of a European power to control the form of government, or political destinies of the republics of the American continent. While these two principles were undoubtedly intended and did serve to protect the interests of the republics of Central and South America, the fundamental purpose of the declaration was one of national self-protection. There is no doubt that the enthusiasm of the people of the United States was aroused by the fact that the doctrine served as a mantle to protect the republics of the American continent against European aggression, but the primary purpose of the framers of the doctrine was to assure the national safety and unhampered development of the United States. Accompanying this primary purpose there was undoubtedly deep sympathy with the republics of Central and South America and in the Congress of the United States, led by men like Henry Clay, that sympathy expressed itself in no uncertain terms. But to the minds of its framers, the doctrine was primarily one of national self-protection. It is well to emphasize this point because of the fact that it gives to the doctrine a permanency and a vitality independent of the will and independent of the attitude of the countries for whose benefit it was originally formulated.

The government of the United States, from the time of the founding of the republic, was conscious of all the difficulties resulting from the rivalry of European interests on the American continent, and the cardinal principle of our foreign policy was to free the country for all time from the complications which would necessarily ensue from such rivalries. It is true that the conditions of today are totally different from those that confronted President Monroe in 1823. At that time he and his cabinet were formulating a principle which, as has been stated by Admiral Mahan, was a declaration of independence, not merely of one country, namely the United States, but of an entire continent; but it must always be remembered that the

declaration was formulated primarily in the interests of the United States.

If we approach the situation from this viewpoint, it is not difficult to see that the doctrine in so far as it involves the principle of national self-protection is quite as vital today as it was in 1823. We are told that no European country desires any territory, or desires to extend its influence on the American continent.

It seems to be taken for granted in such statements that the desire for extension of influence involves something essentially reprehensible. Nothing could be farther from the truth. The desire for the extension of national influence is not only entirely natural, but gives evidence of the vigor and buoyancy of national life. With a great territory but sparsely settled, it is inevitable that the great powers of Europe should regard Central and South America as a possible field for national expansion. The settled purpose of the American people to keep the American continent free from European complications and rivalries is quite as necessary today as it was in 1823. Whatever may be the views of any particular administration with reference to the principles of the doctrine, it is clear to anyone who takes time to study the temper of the American people that they would not tolerate the abandonment of the principle that the destinies of the countries of the American continent shall not be controlled by any European power, or any coalition of European powers. This is the real, vital content of the Monroe Doctrine, at the present moment. Extensions of this principle no longer represent the Monroe Doctrine, but new principles of American foreign policy which must stand or fall as they prove favorable or unfavorable to national advance and national welfare.

The first important extension of the Monroe Doctrine was made by President Polk in 1845, when in connection with the proposed Oregon boundary question and the annexation of Texas, both of which questions were then pending, he said:

"That it should be distinctly announced to the world as

our settled policy, that no future European colony or dominion shall, with our consent, be planted or established on any part of the North American continent."

It will be noted that in this declaration the President extended the non-colonization principle to include any form of "dominion," which would, therefore, seem to mean that even a voluntary cession by an American republic to an European country would be resisted by the United States. This view was emphasized further by President Polk in 1848, when an Indian uprising in Yucatan aroused such consternation amongst the white inhabitants that the state authorities made overtures of annexation to the United States. Similar overtures were made to England and Spain. In dealing with this situation, in his message, President Polk said:

"According to our established policy, we could not consent to a transfer of this 'dominion of sovereignty' to either Spain, Great Britain, or any other European power. In the language of President Monroe, in his message of December, 1823, 'we should consider any attempt on their part to extend their system to any portion of this hemisphere as dangerous to our peace and safety.'"

The principle formulated by President Polk, that the doctrine includes a prohibition, not only upon the extension of European colonization, but any advance of European dominion was not included in the Monroe Doctrine of 1823, but has become an added principle of American foreign policy; sanctioned by time, and not likely to be abandoned.

With the formulation of our national policy with reference to the Venezuelan controversy of 1895 we come to a phase of our national policy which has given rise to the widest differences of opinion. It is a grave question whether it was either a wise or a tenable proposition for the secretary of state in one of his dispatches to the British government to formulate the principle that the will of the United States is sovereign on the American continent. That statement involves an implication going far beyond either the intent of the original doctrine

or the principles of the present foreign policy of the United States. A great country like the United States, having entered upon the larger obligations of world politics, with its corresponding responsibilities, cannot hope to retain as the sum total of its foreign policy a set of purely negative prohibitions. The Monroe Doctrine therefore must be supplemented by a series of positive principles which will give to the foreign policy of the United States a position commensurate with the responsibilities which this government must sooner or later assume.

The first step in the development of this more constructive foreign policy was made in 1905 in the adjustment of our relations with Santo Domingo. It was evident that the United States could not in the long run say to the European powers, "You shall not in any way control the destinies of American States"—especially if such a declaration deprived them of certain definite rights guaranteed to them under international law—unless the United States were willing to see to it that these rights were safeguarded. The most serious questions that arose in this connection were the status of American states deeply indebted to European countries or to their citizens, and the attitude of the United States toward measures which such European countries might take in order to protect the investments of their nationals. President Roosevelt, in his message of 1905, took the position that while the United States could not and should not endeavor to protect the American states from the consequences of their own wrong-doing, and while we could not fairly object to any measures which the European states might take in order to protect their own interests or the interests of their subjects, we could not view such measures with indifference if they took the form of occupation of American territory. One of the customary means of bringing recalcitrant nations to terms is the occupation of the custom houses, the collection of revenues and the sequestration of such revenues. Whatever may be our judgment as to the morality of this procedure, it is a method which has

been resorted to frequently. The Government of the United States, in order to protect Santo Domingo against such proceedings, entered into an agreement with the government of that country for the reorganization of her finances, acting as it were as trustee both for Santo Domingo and for the European bondholders. In other words, in our relations with Santo Domingo we announced not the Monroe Doctrine but a new principle of American foreign policy, namely, that the maintenance of our traditional policy on the American continent—the prevention of a control of the destinies of American states by European countries—involved a positive responsibility to interpose between the American states and the European countries, when European interposition threatened to take the form of permanent or temporary occupancy of American territory.

As was said by President Roosevelt in his message to Congress dated December 5, 1905:

"Moreover we must make it evident that we do not intend to permit the Monroe Doctrine to be used by any nation on this continent, as a shield to protect it from the consequences of its own misdeeds against foreign nations. If a republic to the south of us commits a tort against a foreign nation, such as an outrage against a citizen of that nation, then the Monroe Doctrine does not force us to interfere to prevent punishment of that tort, save to see that the punishment does not assume the form of territorial occupation in any shape. The case is more difficult when it refers to a contractual obligation. Our own government has always refused to enforce such contractual obligations on behalf of its citizens by an appeal to arms. It is much to be wished that all foreign governments would take the same view. But they do not; and in consequence we are liable at any time to be brought face to face with disagreeable alternatives. On the one hand, this country would certainly decline to go to war to prevent a foreign government from collecting a just debt; on the other hand, it is very inadvisable to permit any foreign power to take possession, even temporarily, of the custom houses of an American republic in order to en-

force the payment of its obligations; for such temporary occupation might turn into a permanent occupation. The only escape from these alternatives may at any time be that we must ourselves undertake to bring about some arrangement by which so much as possible of a just obligation shall be paid. It is far better that this country should put through such an arrangement, rather than allow any foreign country to undertake it. To do so ensures the defaulting republic from having to pay debts of an improper character under duress, while it also ensures honest creditors of the republic from being passed by in the interest of dishonest or grasping creditors. Moreover, for the United States to take such a position offers the only possible way of ensuring us against a clash with some foreign power. The position is, therefore, in the interest of peace as well as in the interest of justice. It is of benefit to our people; it is of benefit to foreign peoples; and most of all it is really of benefit to the people of the country concerned."

The first step in the development of a more positive foreign policy must be followed by a series of additional steps quite as important as the one taken in 1905. It is, of course, somewhat dangerous to attempt to indulge in prophecy, but we may at least from this analysis of the situation reach some conclusion as to what changes are necessary because of conditions now existing on the American continent and leave it to the future to determine whether these steps will or will not be taken in the actual formulation of the foreign policy of the United States.

The next step in the development of a constructive foreign policy of the United States on the American continent is the abandonment, definitely and for all time to come, of the attempt to develop a so-called "Latin-American Policy." In other words, the foreign policy of the United States must be adjusted to meet the peculiar requirements of the different sections of the American continent. Our foreign policy with reference to Mexico is one thing; our foreign policy in Central America another thing; whereas our foreign policy toward each of the countries of South America involves a different and dis-

tinctive group of problems. I am tempted to go so far as to say that our foreign policy with each of the countries of South America requires the application of different principles; we cannot have a general South-American policy. Our relations with the Argentine Republic must be based not upon any general considerations relating to South America as a whole, but upon the special conditions prevailing in the Argentine Republic; the special conditions prevailing in Chile; the special conditions prevailing in Brazil, and so on with all the countries of South America. It is evident, furthermore, that our relations with those countries of Central America adjacent to the Panama Canal Zone, such as Colombia and Costa Rica, will be determined by considerations different from those which are applicable to countries like Guatemala.

Taking up each of these international situations for brief consideration, I desire first, to discuss the general principles which must govern our relations with Mexico. It is evident that these relations are influenced by conditions which do not apply to any other country on the American continent. There is, first and foremost, the primary fact that she is our neighbor and that the disturbance of public order in Mexico is a matter of vital interest to the United States. We cannot remain indifferent to continued disorder in Mexico any more than we could have remained indifferent to continued disorder in Cuba.

Our foreign policy with reference to Mexico must be dictated by principles which will secure the re-establishment of order through the constituted authorities. Unless we are willing to pursue such a course, we will be forced by the logic of events to assume the responsibility for the restoration of order. The fact that Mexico is our neighbor; the fact that the lives of more than fifteen thousand Americans are at stake, together with the enormous material interests involved, mean a relationship with Mexico totally different from the countries of South America.

Considerations of a similar nature apply to our relations with the countries adjacent to the Panama Canal Zone. We

are more deeply concerned than any other country in the establishment and maintenance of order in these countries, and our policy with reference to them must be to do everything in our power to strengthen the hands of the constituted authorities, or, if we are unwilling to take this course, we are forced again by the logic of events to undertake the restoration of order through our military power. With reference to the countries of South America, a totally different situation presents itself, but the importance of developing a positive, constructive foreign policy is none the less pressing.

In South America we find developing a series of international problems of the most difficult and delicate nature; problems which may in time endanger the peace of that section of the American continent. Now, while our interest in the maintenance of peace in and between the republics of South America is different, both in kind and in degree, from our interest in the preservation of order in Mexico and in some of the countries of Central America, we are none the less bound to contribute within the measure of our influence toward the maintenance of peace, because its disturbance involves a menace to the independence of those countries. The cardinal principle of our foreign policy with the countries of South America must be the promotion and maintenance of peace. In the execution of this purpose there is the possibility of developing an American concert similar in some respects, but far more effective, than the action of the European concert.

Furthermore, there exist in South America a number of small states whose permanent relations to their neighbors have not as yet been definitely or finally established. The rivalry for influence over such states as Paraguay, Bolivia and Uruguay is a constant menace to the peace of the South American countries. The fact that the United States can view this situation impartially, will enable our government to exercise an important if not a determining influence in the maintenance of peace, in the maintenance of existing territorial relations and in bringing about the peaceful settlement of present or future disputes.

Through such a concert of powers, which should include the Argentine Republic, Chile, Brazil, Peru and the United States, the relations between the republics will be treated as a matter of continental interest and importance. With this adjustment, the Monroe Doctrine has little or nothing to do. We have an interest in the settlement of the controversy regarding the jurisdiction over the River Plate in that it should not become the cause of a continental conflagration; we have an interest that the position of Paraguay should not lead to armed conflict amongst those of her neighbors who are engaged in a more or less friendly rivalry for the extension of control over Paraguayan policy.

In the accomplishment of these purposes, which at the same time serve the interests of world peace, our interests run parallel with the interests of the great countries of South America, and we should, therefore, move not only in harmony but in active and helpful co-operation with them. The development of such a policy, as well as its final success, depends on the possibility of allaying the fears of the republics of South America with reference to the motives and ultimate purposes of the United States. Mere personal assurances, such as those given by President Wilson in his speech at Mobile, will have but little effect. The only way in which we can hope to allay those feelings is through closer personal ties; closer intellectual and cultural relations with the peoples of these countries. As their acquaintance with the people of the United States grows in breadth and depth and as we learn to respect the dignity and value of the civilization represented by the leading countries of South America, as our appreciation of their progress becomes more accurate, there will undoubtedly develop a feeling of mutual confidence which will make it easier for the official relations of the governments to be determined by that spirit of co-operation without which a truly continental policy is impossible. Until that better understanding and better appreciation of motives, intents and purposes between the peoples of North and South America can be established, it will

be exceedingly difficult to allay the distrust which undoubtedly now exists with reference to the sincerity of the purpose of the United States. Until then it will be exceedingly difficult to eradicate the idea that the Monroe Doctrine is simply a notice to Europe to keep "hands off" from Central and South America until the time is ripe when the United States will extend not only her influence but her sovereignty to those sections of this hemisphere.

No merely formal assurances that the United States is not seeking territorial aggrandizement will suffice to allay the feeling that has been aroused by reason of the uncertainty as to the ultimate intentions of the United States. This feeling can be allayed only by the development of that spirit of confidence which comes from a better acquaintance with the aims and purposes of the American people. Up to the present time we have done nothing to acquaint the inhabitants of the Latin-American countries with the real spirit of our American civilization. The intellectual currents from and to South America are toward and from Europe. The time has come when a concerted effort must be made by our universities and other institutions of learning to foster those intellectual ties upon which mutual understanding and mutual confidence rest. The similarity of environment and the similarity of the problems of many of the countries of North and South America furnish an admirable basis for the development of greater community of thought and action.

And now a word with reference to the relation of the Monroe Doctrine to the accepted principles of international law. There seems to be a tendency in some quarters to regard the incorporation of the Monroe Doctrine into the existing body of international law as one of the great purposes of our national policy, and that such an acceptance would mean a real triumph for American diplomacy. If, however, we stop to analyze the part which the Monroe Doctrine has played and may be destined to play in the development of our international relations, it becomes clear that not only have we no national interest in

securing the acceptance of the Monroe Doctrine as a principle of international law but that all our interests are in precisely the opposite direction.

The Monroe Doctrine is nothing more than a principle of American foreign policy depending alone on the will of this country, and subject at all times to such modification as our national interests may dictate. It remains a principle of our American foreign policy as long as we desire and as long as we are able to maintain it, but we must at all times hold ourselves free to make such modifications as the requirements of national welfare may demand. Any attempt to incorporate the doctrine into the body of international law would mean that an important part of our foreign policy has been placed in a position beyond national control, a condition manifestly undesirable because opposed to our real national interests.

As long as the Monroe Doctrine serves the fundamental interests of national protection, and as long as it enables us to avoid the menace of European complications on the American continent, and as long as it contributes toward the preservation of the territorial integrity and national well-being of the American republics, so long and so long only will it deserve to remain an integral part of our foreign policy, and will it assist us in fulfilling that higher mission, as one of the guardians of the peace of the western world.

We have seen, therefore, that the Monroe Doctrine at the time of its formulation was not a new principle of American foreign policy; it was simply the application to two concrete international problems of those fundamental principles of national self-protection which are of universal application, and which have found expression in the European doctrine of the balance of power, and in the action of the European concert. This principle of national self-protection, which prohibits European countries from making any attempt either to overthrow or control the destinies of American states, is quite as vital today as it was ninety years ago. The real danger of the present situation is due to the vagueness and indefinite

thinking which has characterized the attitude of the American people toward the Monroe Doctrine.

One of the most profound students of American political institutions—Professor Burgess—has referred to the Monroe Doctrine as one of the fetiches of the American people and one of the keenest of foreign observers (A. M. Low) has said of it that it casts a spell over the national thought of the people of the United States, a spell which allows emotion rather than sober reason to dominate public thinking on foreign affairs.

In a democracy such as ours there is a real danger in such a situation, a danger which arises from the fact that such emotional support always affords the opportunity to unscrupulous or incompetent political leaders to avail themselves of this attitude for purposes that are not consonant with the permanent interests of the country. There have been a number of attempts in the course of our national history to use the Monroe Doctrine as a shield for ulterior purposes intended to promote sectional rather than national interests. When the British-American Act which united the Dominion of Canada was under consideration, the attempt was made to arouse American opposition to the measure on the ground that it was out of harmony with the Monroe Doctrine. It would be difficult to imagine a more unwarranted abuse of the real principles of the doctrine.

The question which presents itself to the American people, therefore, is not whether the Monroe Doctrine should be abandoned, but rather whether it is safe for a great world power like the United States to use a political catchword or shibboleth as an all-inclusive principle of foreign policy rather than meet each new international situation as it arises with principles which appeal to the sober judgment of the American people. An emotional response to a political catchword can never become the basis of a sound foreign policy. President Wilson has well said that the questions of the day are not "mere questions of policy and diplomacy. They are shot through with principles of life." This profound truth means

that the foreign policy of the United States must become as much a matter of national thought as the principles which are to govern the solution of our domestic questions.

If, therefore, we are to continue the use of the term Monroe Doctrine, let us confine it to the principle which our national safety demands, namely, the declaration against European interference with the political destinies of American states. Whatever principles we may find it necessary or desirable to add, let us recognize them frankly as new principles of American foreign policy, to be justified on the basis of imperative national interests or of manifest international obligations.

We are told by no less an authority than the Lord High Chancellor of England (Lord Haldane) that the Monroe Doctrine involves a necessary corollary that the United States will assume the responsibility for good government and fair treatment for the smaller nations of the Western Hemisphere. This may or may not become a principle of American foreign policy, but whatever the future may have in store, let us clearly recognize the fact that such a principle is no part of the Monroe Doctrine, and that it must, therefore, be discussed and justified by reasoning extraneous to the doctrine.

We are told by another distinguished observer of American institutions that the Monroe Doctrine involves a duty on the part of the United States "not only to protect the political entity of Latin America but also to preserve its financial independence; to save it from its own weakness, to protect it from becoming a victim of concessionaires, whether they be American or European; to enable Latin America to develop itself without selling itself into bondage; to encourage Latin America to respect itself, so that it may have the respect of the whole world." Here again we have a principle which if accepted becomes a new principle of American foreign policy, but remotely related to the Monroe Doctrine and which should not be permitted to masquerade under an assumed name.

Some months ago in an address delivered before the Southern Commercial Congress the President of the United States

took a similar position. In formulating a new principle of American foreign policy, the purpose which he seems to have in view is the gradual financial emancipation of the countries of Central and South America from their present dependence on European capital. In the course of this address the President attacked "the material interests that had influenced the foreign policy of certain governments in their relations with the nations of Latin America." He declared it to be the duty of the United States "to assist the nations of this hemisphere in their emancipation from the material interests of other nations, so that they might enjoy constitutional liberty unrestrained." "You hear," he said, "of concessions to foreign capital in Latin America . . . States that are obliged to grant concessions are in the position that foreign interests are apt to dominate their affairs. Such a state of things is apt to become intolerable. It is emancipation from this inevitable subordination that we deem it our duty to assist."

It is true that the President restricted himself to a declaration against "concessions," and it would seem that to his mind this term involves the idea of special privilege or monopoly. The nearest equivalent of the Spanish word "concesión" is our own legal term "franchise." It is true that in many of the countries of Central and South America such franchises include the grant of monopolistic privileges. It is also true that under the cloak of such franchises many abuses have been committed, but we must bear in mind that the unsettled political conditions prevailing in many of these countries and the exceptional risks to which foreign capital is subjected have made it necessary to offer special inducements in order to attract foreign investors. If we stop to reflect on the extraordinary inducements which were offered to foreign capital during the early history of the United States, and on the great service which such capital rendered to our national development, we can readily see that any policy the effect of which is to discourage foreign investments in Central and South America cannot help but retard the development of those sections of the

continent. We may deplore the fact that in many of the republics of the American continent there has been a wasteful and at times a corrupt distribution of franchises and special privileges, but is it either our duty or our right to determine or even to suggest the standards to which the investment of foreign capital shall conform?

At all events let us not close our eyes to the fact that the formulation of this policy has aroused serious misgivings throughout the countries of the American continent, as it is looked upon as an unwarranted assumption of control over their liberty of action. In Europe the President's pronouncement is regarded as confirmatory of a suspicion, which has been growing within recent years, namely, that the United States has embarked upon a national policy, the purpose of which is to reserve the less advanced countries of the American continent for the economic exploitation of American capital.

Whatever the ultimate judgment on the appropriateness of the principles or the wisdom of the policy formulated in the President's Mobile speech, it should be made clear that this new orientation of our foreign policy is not a part of the Monroe Doctrine, and has no organic relation to the fundamental principle upon which the Monroe Doctrine rests, namely, national safety and self-protection. It is a new and strange principle which has aroused the opposition of the countries for whose benefit it is intended, and has engendered bitterness of feeling amongst European peoples. If it is to be maintained it must justify itself by basic reasons of national interest and international obligation entirely independent of the Monroe Doctrine.

Permit me in closing to summarize briefly the position which I have taken with reference to the Monroe Doctrine in its relation to American foreign policy:

1. The Monroe Doctrine while based on a recognition of the principles of international law, namely, the right of self-protection, is itself not a part of international law, nor have we the slightest interest in having it so recognized; on the contrary, it should remain a principle of our national policy suf-

ficiently elastic to enable us to modify or even discard it if for any reason we become convinced that it is no longer consonant with our national interests.

2. The Monroe Doctrine as originally formulated comprised two principles: first, a declaration against further European colonization; and, secondly, a declaration against European control of the political destinies of American states. Owing to the fact that there is no further territory open to colonization, the first principle is no longer applicable to existing conditions. The declaration against European control of American states is as vital to our national safety and well-being today as it was ninety years ago. It implies no hostility toward European countries, but simply embodies the results of accumulated experience, namely, the unwisdom of permitting the American continent to become the theatre of European rivalries.

3. We should never permit the Monroe Doctrine to become a cloak, behind which any country may take refuge for the purpose of escaping the consequences of its wrong-doing. European countries should be given a free hand in pursuing the remedies recognized by international law for the redress of grievances, but such remedies should never be permitted to assume the form of a permanent occupancy of American territory, or permanent control of the destinies of an American state.

4. Where the conditions are such that the only effective remedy involves the danger of such control, the United States is entirely justified, as a principle of its foreign policy entirely independent of the Monroe Doctrine, to pursue the course followed with reference to Santo Domingo in 1905 and which was in effect the reorganization, under American auspices, of the finances of that country, and the lending of our aid and support in the administration of its revenues. All these steps were taken, mainly, for the benefit of European creditors.

5. Neither the Monroe Doctrine nor any additional valid principle of our foreign policy justifies the assumption of responsibility either for the fair treatment of Europeans, resi-

dent in the countries of Central or South America, or for the maintenance of the financial independence of these countries.

By reason of peculiarly favorable circumstances we have become the leading power of the Western Hemisphere in population, wealth and power, but the fact of such a position involves the necessity of forbearance and self-control in order that such power shall not be abused.

6. We must abandon the idea of developing a "Latin-American policy." The general principles of 1823 were applicable to all parts of Spanish and Portuguese America at a time when the newly established republics presented many common characteristics.

A century's growth, however, has so differentiated these countries that the United States must develop its relations toward each of them with the same care and discrimination that Great Britain exercises in its relations with the countries of Continental Europe. As we have seen, a policy adapted to Mexico is inapplicable to the Argentine, Brazil, Chile or Peru, and a policy which is necessary in dealing with Nicaragua or Colombia is inapplicable to Guatemala or Salvador.

Nothing is more distasteful to the more advanced countries of South America than to hear the President of the United States or the Secretary of State speak of a "Latin-American policy." Nothing offends them more deeply than when the Government of the United States attempts to admonish the Latin-American countries as if they were all in the same category.

7. The rapid development of the leading countries of Latin America, especially the Argentine, Chile, Brazil and Peru, has prepared the way for the development of an American concert which can be far more effective in its action than the European concert. The pending international problems of South America can best be solved by the concerted action of these five great powers, and the sooner we prepare for such concerted action the better will we be able to serve the cause of peace and goodwill on the American continent. In order to prepare for such concerted action we must cultivate closer

intellectual and cultural ties with the countries of Central and South America. Only through such means will they secure a clearer understanding of the point of view of the people of the United States and will we be able to appreciate more fully their aspirations and ideals.

8. Finally, it is evident that the United States can exert its greatest and highest influence on the American continent by the force of its example rather than by any self-constituted guardianship.

Let us see to it that every treaty entered into by the United States is faithfully observed. Our present reputation amongst the nations is that of a country prone to a narrow and technical interpretation of treaty obligations. Our failure at critical periods to fulfill our full duty toward foreigners resident within our borders, the helplessness of the Federal Government to give adequate redress for injuries to foreigners caused by mob violence, the attempt at a highly technical interpretation of the Hay-Pauncefote Treaty, in order to justify the exemption of American coastwise shipping from Panama Canal tolls, have made a painful impression throughout the civilized world. A due regard for the sanctity of these obligations, and a firm determination carefully to observe the rights of the weakest as well as the most powerful nation with which we may be brought into contact, these are the principles which will give to this country a real position of leadership, and will enable it to secure the goodwill and active co-operation of the countries of Central and South America.

With the Monroe Doctrine limited to the principle which remains vital to our national safety, with a constructive foreign policy dealing with every country in accordance with its needs and our own national requirements, and with a position of leadership assured by our example, rather than by our military or naval force, we will best accomplish the two-fold purposes which American foreign policy must ever have in view: the protection of our national interests and the promotion of the peace and progress of the entire American continent.

THE ECONOMIC AND BIOLOGIC ASPECTS OF HOOK-WORM DISEASE IN THE SOUTHERN UNITED STATES

By Allen J. Smith

Professor of Pathology and of Comparative Pathology; in charge of the courses in Tropical Medicine
University of Pennsylvania

The Provost introduced the speaker and said in part that while it is known in a general way that a serious disease due to hook-worm exists in the south, our northern audiences are not likely to understand the real importance of the ravages by the "African Vampire," and are unlikely to be acquainted with the extent of the efforts being put forth for its eradication; and that believing these matters should be known here as well as in the district immediately concerned, he had asked one of the members of the faculty who had had considerable acquaintance with southern conditions from residence in the far south for years, and who, in fact, had been the person who discovered and first established the existence of hook-worm disease in the United States, to discuss the subject.

Professor Allen J. Smith spoke as follows:

Viewed in retrospect at this time, with the advantages of fuller appreciation of the biology of the particular parasite concerned, and of a fairly accurate knowledge of its geographic distribution in continental United States, it may be said with some confidence that prevalence of "uncinariasis" or "hook-worm disease" in our southern states has been determined and maintained by three important factors: (*a*) the introduction of the parasite, presumably from Africa with the immigration of negro slaves, (*b*) the favoring influences for its development in the climate and physiography of the district in which it was implanted, and (*c*) the factor of the social condition of the inhabitants in influencing its maintenance and extension.

It should be recalled *imprimis* that hook-worm disease is not strictly limited to man, but that important affections

produced by special forms of hook-worms are likewise met in a number of lower animals, as the dog and cat families, cattle, and even the seals of our northwest Pacific. The hook-worms of these lower animals are to the best of our knowledge incapable of development and of inducing the usual symptoms of uncinariasis in man (with an exception to be noted later for one species); and, conversely, the species of hook-worms met in man are, except in certain anthropoid apes, incapable of development and disease production in the lower animals. There is, however, a possibility, which, as far as my personal knowledge extends, has never been investigated, that any type of hook-worm larva may enter the skin of any approximately suitable host and cause therein local disturbances (as the familiar ground-itch which precedes the intestinal parasitism), but there is no evidence that foreign species ever develop in the non-specific host. It may further be remembered that there are not less than three different species of hook-worms which infest man, and that in a general sense hook-worm disease, as produced by all three species, has an extremely wide distribution in the tropical and subtropical portions of the world. Until 1901–02 the known distribution of these parasites was mainly limited to southern Europe, the Mediterranean borders of Africa, southern Asia and the eastern Archipelago, with a secondary occurrence in South and Central America; and until 1902 it was believed that but a single species of these parasites (*agchylostoma duodenale*) existed. In 1901 and '02, beginning with the discovery of hook-worms in man widespread in Texas and with their discovery a few months later in Virginia by Claytor, coupled with their earlier recognition in Porto Rico by Ashford, an intensive study, brilliantly and energetically encouraged by Stiles and largely impelled by the recognition of the now well-known species *necator americanus* by the latter, was inaugurated and is still maintained; which has added a large part of the southern United States to the world area of uncinariasis. And, perhaps partly influenced by the American studies but more particularly by the general interest in tropical

medicine induced by the inclusive world movements which we know as imperialism in this country, the disease was recognized in most of the countries of southern and western Europe, not only in northern Africa but in the western, central and eastern portions of that continent, in Turkey in Asia, India, Ceylon, Siam, Annam, China, Japan, the Philippines, Borneo and the islands of the Eastern Archipelago, Australia, the Hawaiian Islands and scattered islands of the Pacific, the general group of the West Indian Islands, Mexico, Central America, and the greater part of South America from the north well down to the upper level of the Argentine and Chili. To the two species, *agchylostoma duodenale* and *necator americanus*, a third species, *agchylostoma ceylonicum* (originally found by Loos in a civet cat in 1911 and identified in man and in the domestic dog and cat and in a captive African lion in the Calcutta Zoological Gardens by Lane in India in 1913), has been recently added, this species being notable from its ability to influentially parasitize man and a number of lower animals among the cats and dogs. The general effects of all three species are so nearly identical as to justify our conception of the pathological sequences as one disease, although there are minor differences which are attributable in somewhat uncertain degree to the specific types of the parasites; and the profession has to this time utilized knowledge obtained by study of the biology and pathogenic effects of one or other species with considerable confidence in covering hiatuses in our actual proved knowledge of the others.

In the continental United States (to which the further consideration of this paper is to be especially devoted), with occasional exceptions explicable upon individual importation of the worms from parts of the world where *agchylostoma duodenale*, the "old-world" hook-worm, prevails, the species of hook-worm has proved to be the now well-known *necator americanus*. The introductory assertion that it was probably imported with negro slaves from Africa must rest upon the facts that this species has been found in the pygmies of the

deep forests of Central Africa in 1905 by Loos, and at nearly the same time by Leiper in the Guinea negroes of the west coast, whence a large proportion of American slaves were derived. They have also been identified from the gorilla (but not from the chimpanzee, as announced by Linstow about ten or eleven years ago). The extremely isolated life of the pygmies and the still greater isolation of the gorilla are strongly corroborative of the belief that the American parasite originated in Africa; and the order of susceptibility to the effects of the hook-worm among the negro race (harboring the worm but apparently suffering little from its influence), the white race (manifesting greater susceptibility than the negro race to the effects of the hook-worm) and the American Indians (as shown at least by the Seminoles of the Florida Everglades who suffer even more severely than the whites) is also confirmatory of the view stated (arguing that the race longest infested should have acquired the greatest tolerance, while that infested for the shortest time should have least immunity to its effects). The same view is expressed by Drs. Ashford and Igaravidez in their report upon Hook-worm Disease in Porto Rico to the United States Senate in 1911.

Negroes were brought into continental United States in early colonial days, as early as 1620. While the system of negro slavery was first recognized in the north, it rapidly died out there; beginning later (as in Virginia in 1766) in the southern Colonies, but here for economic reasons developing. By the time of the beginning of the war of the Revolution there were in round numbers 300,000 negroes in the country, over ninety per cent slaves, but few of these colored people living outside of the southern states as then known; by 1800 the number had increased to more than a million; at the opening of the Civil War they numbered nearly four and a half millions; and since emancipation the race has more than doubled in the country, remaining concentrated for the most part in the southern states, but scattering in overflow mainly into the north and east. The negro has been repeatedly shown by actual investigation

to be a common host of the parasite, but is possessed of singular resistance to its dangerous effects—circumstances which in themselves suggest the easy possibility of insidious dissemination of the disease with the movement of the slaves from the old to the newer slave districts throughout the South. *Timeo Danaos munera ferentes!* Whatever the negro has suffered from his contact with the whites (dread tuberculosis and all) by his introduction of necator among the whites he has unwittingly worked terrible revenge for the bondage he underwent and the scourges of disease and poverty since he was granted freedom.

The hook-worm district of continental United States, as we know it, corresponds closely to the old distribution of slavery in the main. It includes the great Atlantic coastal plains from Virginia south, merging with the Gulf coast to the Rio Grande; it extends over the Piedmont district, the Cumberland and Tennessee plateau and the alluvial plains along the Mississippi from Missouri south, with inclusion of at least the Kentucky side of the Ohio. By states the infestment has been proved in the Virginias, the Carolinas, Georgia, Florida, Mississippi, Louisiana, Texas, Arkansas, Tennessee and Kentucky; a part of our country containing approximately nearly a million square miles. The soil of almost all the coastal plain along the Atlantic border and in the alluvial plains along the Gulf of Mexico and the Mississippi is of light sandy character or a sandy loam, with scattered beds of clay and limestone, especially back toward the "fall-line" of the plateaus; and in the longitudinal valleys of the Appalachian Mountains, as in eastern Tennessee and in lower Virginia, similar characters prevail. It is in this type of soil, particularly where it is well watered, that the hook-worm larva best maintains its life and vigor for transmission into the prospective human host. In the higher levels of the Piedmont and the Alleghany and Cumberland plateaus the soil, interspersed with limestone, sandstone and metamorphosed igneous rock, presents in many places a similar loose character, especially in the upland valleys; where, too, soil moisture is apt to prevail to a sufficient extent to favor

the development of the larva of the hook-worm with which the ground may have become polluted. Definite limestone districts and to a less degree soils of a heavy clay composition are unsuited to the life of the larva, which best passes its free stages in a wet or moist loose-grained type of ground. That the prevailing warmth of the air generally characterizing the area of country indicated is favorable to the incubation of the hook-worm ova deposited in the soil and the young larval worms goes almost without saying. Excessive heat, the direct rays of the sun and excessive drying of the sand are harmful to them; but the same conditions are not favorable to agriculture as ordinarily practiced, so that districts of this type are scantily populated at best. But sufficient moisture to prevent baking of the soil, combined with the optimum conditions of thick agricultural population and suitability of climate and soil, make certain areas, constituting a larger percentage of the whole number of square miles of the south, most favorable for propagation of the disease. Roughly estimated, the population of this portion of our country reached in the census of 1910 a total of 25,000,000, of whom about one-third are negroes. Excluding the population of properly organized cities, where uncinariasis is afforded little or no facility for persistence, and those portions of the south which are for one or other climatic or physiographic reason unsuited to its maintenance, it is probably not an exaggeration to hold that one-half of this population is so situated that it constitutes a potential field for the direct effects of the disease; while of course the whole southern population (and in a sense that of the whole country) are indirectly influenced economically.

The absence of a fairly constant atmospheric warmth is not necessarily a barrier to the extension of the hook-worm; probably other factors are much more important reasons why the disease has not spread in increasing proportions to other parts of the United States. Occasional cases are met above the Potomac and a few are known to have originated north of this roughly limiting boundary. The "old world" worm is a serious

parasite of man in the Cornish mines in England; and a native case of this species of infestment has been reported from New York. We not infrequently meet with serious canine hook-worm disease in our northern states, and on Prince Edward Island the fox-farm industry is said to have suffered from a million to a million and a half dollars in a single season from the ravages of hook-worms among the young foxes. So, too, the seals of Pribiloff Islands are known to harbor a species of hook-worm which has at times assumed financial importance from its effects upon the seal-pups. It is not fair, perhaps, to base any fixed argument upon comparison, between the different species of hook-worm involved, as there are doubtless biologic differences which impair the credibility of such comparison; but the differences are probably not so great as to completely exclude at least a non-rigid comparison. Undoubtedly because the vast majority of infested negroes were concentrated in the south the chances of development of the disease were proportionately increased for the latter district; but with the movement of the negroes into the north, and with Italian and other southern European immigration, there have most probably been numerous instances of importation of both the "new-world" and "old-world" types of hook-worm into other sections of the United States. That the most of these in the natural course of events have died out without permanent implantation was not due to mere climatic conditions or peculiarities of the soil. The warm period of summer in our northern and eastern states, where large numbers of these negroes and south European immigrants located as laborers, is quite long enough and warm enough to permit development and the dissemination of the larvæ into new hosts; and it clearly becomes necessary in addition to take into consideration the general social relations of the two sections of the country to explain the discrepancy.

The special points in the life history of the hook-worm which bear in this relation are these: (*a*) the ovum is passed with the intestinal discharges of the host to the exterior; (*b*) from the eggs the young larvæ hatch best at temperatures varying from

80 to 95 degrees F., in the presence of moderate moisture and of at least a small amount of available oxygen, in one or two days; lower or higher temperatures, decreases in moisture and air-access postponing hatching, or, if extreme, destroying the ova; (*c*) with continuance of similar conditions the larvæ grow and undergo two moults in their free life before they are fitted to enter the next host (remaining, however, in the second moult within the old skin); but faults of temperature, moisture or air-access impair their development or kill the larvæ; (*d*) finally they have been proved to gain access to the new host by penetration from the soil in which they have been living into the skin of the subject, usually when the individual is walking with bare feet over the polluted soil or when handling the soil with unprotected hands. Keeping these facts in mind, the third factor indicated as influential in maintaining and disseminating uncinariasis in a given district comes directly into consideration. The development of the north, save in agriculture, has been from the earliest period well in advance of that of the south; and its population has during the same period been more notably concentrated into villages, towns and cities. Public interest naturally demanded and accomplished much more in a general way for sanitary protection in these than in agricultural districts, where isolated families rather than communal collections prevailed. The source and regulation of water supplies, the provision for more or less efficient disposal of fecal discharges, the conveniences of life in housing and in clothing (particularly in this connection in the matter of foot-gear) were naturally matters of interest and of regulation either by law, custom or from convenience; and in these provisions have been raised efficient barriers against the parasite and its permanent extension. In the earliest colonial times and until the development of the west, conditions of trade and local fitness determined the predominance of agriculture in the southern states, to the practical neglect of the rich mineral resources which have awaited recent years for their development. The existence of coal and iron, of salt and of at least a small amount

of valuable metals has been known in the south for much more than a century; but serious workings were not prosecuted until the last twenty-five or thirty years. Oil was seen to escape from the earth in Texas from the time of the Republic or before, but the great gas and oil and sulphur developments of the Louisiana and Texas district practically date within the present century. Cultivation of cotton and tobacco, maize, rice, sugar and indigo was from the first the main interest of the inhabitants, who entered the south mainly from England, or from the northern English and German colonies, and in smaller numbers from France, Spain and elsewhere, as the original stock. The prosecution of agriculture made negro slavery profitable and in that sense a necessity, and drew the infested Africans from their original home across the sea or from the West Indian Islands. These negroes as a race were utterly ignorant of the sanitary necessities of civilized life, and had they known, were in no position to insist upon them. We may here disregard the occasional deliberate cruelties of the system, and must acknowledge that in the main the relation of master to slave was a kindly one, and that for the most part the housing and ordinary clothing and the food supplied the slave and the general supervision of rest and toil were rather to the advantage of the chattel negro. But at the same time it was no uncommon thing to find utterly inadequate provision for fecal disposal in the negro quarters; and statements are in print describing plantation conditions in which note is made of the sole closet on the place being built for the owner's immediate family and kept locked against all others. This condition has persisted and exists now, although improvement is evident in districts which have been especially influenced by the campaign against hook-worms. Stiles, in his report of a preliminary tour of investigation through Virginia, the Carolinas, Georgia and Florida in 1902, scathingly comments upon this lack of provision and ordinary decency; he states that at least one-half the houses of the poorer whites and of the negroes in the rural parts of the country are without any closet at all, or with closets utterly

inadequate to prevent soil pollutions. It is in this failure to effectively get rid of the ova of hook-worms by proper closets or disinfection, and in the consequent distribution of the eggs with the feces promiscuously over the surface of the soil, that the first link in the chain is forged. Orginally the intestinal discharges of the negroes were the sole source of danger; but while during slavery days the negroes were in a measure at least segregated in the quarters, there was always, even then; chance of spread, and doubtless many actual instances of transition to the whites. With the arrival of emancipation the quarters were broken up and the free negroes came to be scattered in their unfit homes all over the country wherever location was possible, and were brought even more intimately in relation with the poorer class of whites; in whom undoubtedly rapid progress was made by the affection. This class of poor whites, of early American ancestry and naturally of excellent physical constitution, existed from the earliest days throughout the south, consisting largely of the managers and more responsible workers of the planatations of the rich, and in part of the small independent farmers. In the general depression of the Civil War and reconstruction days the class was much augmented by the financially weaker branches of the formerly rich class of planters; and as a group was plunged thereby deeply into poverty and squalor. In slavery days these people were sharply divided from the negroes and for racial reasons were admitted into the general white democracy; but the boundary line between them and the blacks became tenuous and doubtful when post-bellum penury became pronounced. Their homes, never too good, became mere huts; they were underfed and poorly clad, uneducated; and in spite of their inborn pride of race were compelled to compete with freed negroes and in many ways to be influenced by them. In these people, unshod and therefore unprotected, uncinariasis gained rapid and serious headway; and as the disease progressed, aided, of course, by other prevalent affections, as malaria and all sorts of physical adversities, these poor whites became as a class a reproach to the country. They

were even despised by the negroes themselves, and were known collectively by such contemptuous eipthets as "poor white trash." Each one of them, diseased, became a focus for further dissemination of hook-worms; and in turn these people, a little more closely in touch with the better classes of whites, aided in eventually fixing uncinariasis upon many of the latter. Thus in the end, at the time when, somewhat less than a decade ago, systematic study of the situation was begun, evidence rapidly developed indicating that in the agricultural and cotton-mill districts of the south Atlantic and Gulf states, and in somewhat lower degree in Kentucky, Tennessee, Arkansas and Missouri, a large percentage of all classes of the population was infested with necator. In 1910 Bagly in Virginia estimated that 80 per cent of the cotton-mill workers of the state were infested; in 1904 Nicholson and Rankin in North Carolina found that 37 per cent of 140 students of Wake Forest University harbored the parasites; in 1910 Bass estimated that in rural Mississippi 50 per cent of the inhabitants were affected; and in the preliminary survey by the staff of the Rockefeller Commission, in ten states (Virginia, the Carolinas, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Tennessee and Kentucky) of the 884 counties of these states, 719 were found to show infection, and in the more detailed county survey to determine approximately the degree of infection in 87 counties in nine of these states, there was shown a percentage infection in the children ranging from 2.5 to 90.2. In the succeeding year (report for 1912), in the survey carried on in 143 counties in 11 states, out of 121,288 children examined, 62,646, or 53 per cent, were found infested. Sufficient data have not yet been obtained to allow an accurate estimate of the degree of infestment for the whole area, but it is probable the percentage for all persons is at least 25 to 33 per cent of the total population.

There is no disease known save malaria which has shown a greater dissemination in the world or in our own southern states than this; and with malaria it must stand at the head of pathological conditions in the harm it has worked and the

retardation of development for which it is responsible. The sudden, brief and occasional holocausts from yellow fever have had incomparably less effect, and even tuberculosis and the other scourges known to our country constitute but a poor second when compared with the steady sapping of the strength and ability of such large percentages of the population, continued without intermission over so many years.

How this is accomplished is best told by recalling briefly the parasite itself, the main points in its life history, and the principal effects of its parasitic life in the human host. The *necator americanus*, an African parasite, has been imported into this land years ago, and there is reason to believe has for a greater or less period been a parasite in from one-fourth to one-third or even more of all the inhabitants of our southern states. The necator is a small round worm zoologically classified among the round worms in the family of *strongylidæ;* subfamily, *strongylinæ;* genus, *agchylostoma;* subgenus, *necator*. All the hook-worms are cylindrical in shape, slightly attenuated anteriorly, colorless, having the head bent dorsally upon the body to form a short, blunt hook (whence the common name of the whole group), with the tail of the female extended to a fine mucronate tip, while that of the male is more bluntly pointed and surrounded by a so-called copulatory bursa, an expansion of the cuticle supported by ray-like extensions of the body wall. The females are characteristically larger than the males. All these worms have a well-developed mouth cavity supported by a chitinous framework and provided with a complex armature of plates or hook-like teeth at the margin, and in the base of the cavity lance-like teeth for cutting the tissues after they are well within the mouth of the worm. There is a strong esophagus; and a series of glands about the head from which is poured into the mouth a secretion (saliva) which contains a substance inhibiting coagulation of fluids sucked from the lacerated tissues, so that as they are drawn from the tissues they may be readily swallowed. They all live in their adult life in the intestinal tract of their definitive hosts, abstracting lymph and blood

from the intestinal mucous membranes. All species reproduce by ovulation, the eggs passed by the intestinal route to the exterior of the host, hatching there under appropriate conditions and giving origin to larval worms, which for a time live independently in the moist soil. In their independent life they undergo a stage of development necessary to fit them so that they can in turn become parasites. This accomplished, as far as is known they all attain their parasitic location by penetrating through the skin of the appropriate host-animal; and, by migration in the body, finally, after passing into the lungs and attaining (with the bronchial mucus) the mouth, they are swallowed and come to their proper habitat in the intestine.

Necator americanus is specifically peculiar in the form of the armament of the mouth, the general size and shape of its body, the detailed anatomy of the male copulatory bursa, the position of the vulvar orifice of the female, and in the size of its eggs. It is a somewhat smaller and more slender worm than the other common hook-worm of man, *agchylostoma duodenale;* the males measuring from six to ten millimeters in length and the females from eight to fifteen millimeters. The mouth, instead of presenting, as in the old-world species, a pair of hook-like teeth on each side of the median line upon the ventral margin, has in the same position a broad chitinous plate with rounded free-cutting borders, and along the dorsal part of the buccal margin a smaller plate of the same type in symmetrical position. In the depth of the buccal cavity there is a pair of delicate triangular-shaped lancet-plates on each side of the esophageal opening; and between the dorsal plates arises an unpaired dorsal conical tooth which projects into the dorsal part of the mouth cavity. The vulvar orifice of the female is situated anterior to the middle of the body, while in *agchylostoma duodenale* it is about the level of the posterior third of the body length. The specific peculiarity of the male bursa is mainly in the fact that, while in *agchylostoma duodenale* the dorsal ray is subdivided and the subdivisions end tripartitely, in *necator* the dorsal ray is divided well down to the body wall and the divisions end in

bipartite fashion. The ova of the *necator* usually range from 0.055 to 0.065 mm. long and 0.038 to 0.040 mm. wide, while those of *agchylostoma duodenale* measure from 0.050 to 0.060 mm. long and 0.030 to 0.035 mm. wide; the eggs of both species are otherwise very similar in appearance, oval, colorless, with a very delicate, rather rigid shell. For further data as to the morphology of the parasite, reference must be made to the current texts and to numerous descriptive articles in the journals of the past ten or eleven years.

The life history of the parasite is briefly as follows: Individual examples may continue to live for at least six or seven years in the intestines. An unknown but probably very large number of eggs is deposited in the intestinal canal by the female worm, perhaps in all thousands. These at time of deposit contain a single fertilized cell; they are carried along with the intestinal contents and when discharged with fecal material show some degree of cellular division. Under appropriate conditions of temperature if they be deposited upon a loose, moist soil, they incubate, and a larval worm emerges in twenty-four to forty-eight hours. Chilling retards incubation, but even freezing for a short time will not necessarily kill the embryo within the shell; and a winter's exposure even in the climate of our own latitude is not likely to kill all of a number of eggs exposed. Heat much over 110 or 112 degrees F. is likely to kill the embryo in the egg; but even such temperatures if not too prolonged or associated with drying need not necessarily be fatal to the embryonal hook-worm. Dessication is lethal if complete; and in dry soils or sands there is little danger of important pollution. The full sunlight is not favorable to incubation. The optimum conditions are those of mixture of the feces containing eggs with a loose moist sand, not too far below the surface to prevent moderate access of air, and a temperature of about 70 to 95 degrees F. The young larva emerged from the egg measures a quarter of a millimeter in length, moves actively in the moist dirt and may migrate to considerable distance (a number of feet) from the site of original deposit. At the end of the second,

third or fourth day after emerging from the egg this larva moults, casting its cuticle and growing in size. In three or five days more it moults a second time, but now remains within the old cuticle which envelops it like a sac. It is sometimes said to be "encysted" in this stage, is much less active in movement, and many remain thus for a long time, certainly a month or two, unless destroyed by heat or cold or drying or exposure to chemical agents. In this stage it is ready to enter a new host, from which the period is often spoken of as the "infesting stage" or "infectious stage." It was long supposed, but never proved in case of man, that transference now took place to the intestine of the host by swallowing the larva with dirty water, unwashed food or in connection with the habit of dirt-eating which is a symptom frequently seen among hook-worm cases. This belief, while not absolutely abandoned, is seriously doubted at present; but actual proof of its incorrectness has not been attained and it is retained *subjudice*, but in little credence. Positive proof exists, on the contrary, that the encysted larva by some unknown influence leaves the soil by its own active movement to penetrate into the skin of some human being who is walking barefooted over the poluted ground or handling the latter with unprotected fingers. As it penetrates the skin the larva leaves behind the old cuticle in which it has been enveloped; and by traveling along the lymphatics it eventually gets into the venous blood and is swept into the lungs. In its passage into the skin a minute injury is affected in this structure, and quite possibly various bacteria are carried with it into the tissues; so that from the combination, especially where a large number penetrate, a local inflammatory lesion is apt to be produced, classed among the forms known commonly as "ground-itch," "water-itch," "foot-" or "toe-itch," etc. When in the lungs the larvæ penetrate through the walls of the capillaries and lining of the air vesicles into the latter, and are gradually carried with the bronchial secretions into the mouth, and thence swallowed. In the lung or soon after they are swallowed they moult again; now changing from their early

forms to acquire the peculiar mouth parts characteristic of the adults. Several days later a fourth and last ecdysis or moult takes place in the intestine and the young worms with fully developed sexual characters emerge, the only later changes being further growth and the phenomena of sexual life. A period of six or seven weeks elapses between the time of penetrating into the skin and the appearance of ova in the dejecta of the host. *Necator americanus* typically inhabits the upper part of the intestine, the duodenum, jejunum and upper third of the ileum. The number of worms which may infest a single individual is exceedingly variable, from a very few to a number of thousands; and the pathological effects vary with the number of parasites present on the one hand, and the age and resistive powers of the host on the other. In a vigorous adult an infestment by many hundreds may be as well borne as fewer than one hundred may be tolerated in a child. The harmful effects of parasitism arise primarily by the attachment of the *necator* to the intestinal mucosa, burying its head well down into the membrane to suck from it lymph and blood. The worm, especially in its earlier life when procreative influences impel it, moves from place to place, leaving behind each time a tiny wound. It generates in its head-glands a substance which, comparable to the substance from the head-glands of leeches, is injected into the wound while the worm is attached and inhibits coagulation of blood; therefore, for some time after abandonment of such a lesion there is a slow oozing of blood. Where large numbers of worms are infesting an individual the total blood loss from this oozing, and from that actually swallowed by the worms, becomes a serious matter, a severe anemia being gradually induced. Blood examination of severe cases frequently shows a loss of over four-fifths of the red blood cells and even a greater loss in the blood coloring matter; and peculiar changes known as eosinophilia are induced in certain white blood cells, this latter feature being of some confirmatory value in diagnosis (common, however, to infestment by various animal parasites and also met in other toxemic conditions). This anemia may

in itself be fatal; and at best, even in light cases, must be regarded as productive of loss of energy, of strength and flesh, and as likely to retard the growth of the young. In addition to this blood loss, however, indefinite and probably complex toxemias are induced which add to the immediate effects of the lesions described. This toxemia may result from local infection of the tiny intestinal wounds, perhaps from some unknown toxin generated by the worms and absorbed from the intestine, and probably also from the interferences with normal digestion followed by putrefaction changes in the intestinal contents with absorption of resulting poisons (a form of fecal toxemia). The duration of life of an intestinal hook-worm is probably a number of years—at least six or seven; and even if there be no repeated infestments (which certainly may take place), the long continuation of blood loss and intoxication of the system is apt in the end to lead to severe secondary degenerations of important organs, and thus to deterioration of health or even to death. The appearance of a well-developed and fairly severe case is striking. The patient is pallid, poorly nourished, often edematous, weak and lethargic, mentally dull, complains of discomfort and perhaps actual tenderness and pain in the duodenal region. His heart is weak and the least physical exercise tires him and brings about difficulty of breathing. The appetite is usually good in mild and moderate cases, often lost toward the end of the severe forms. Altered appetite, of the type of the "pica" of chlorotic girls, induces the well-known tendency to eat dirty, filthy substances, as sand, clay, ashes, chips, cotton, soot, foul mud, etc. From this habit these people have come to be called in derogation "dirt-eaters," "sand-lappers," etc. In the earlier period of the existence of the disease in this country physicians sought to prevent the habit in the hope of curing the anemia, the true cause of which and its relation with the disgusting habit being unknown to them. It was said that dirt-eating introduced into the negro quarters would spread through the quarters and would ruin the efficiency of the whole group of slaves; and efforts to prevent the habit

by tying and chaining the habitue or even by using metal muzzles over the mouth, are recorded.

The effects in children are even more deplorable, retarding growth and development, dulling the mentality, and thus dooming the little hosts to die at an early age or to grow up into a weak and inefficient manhood or womanhood without even the compensation of mental cultivation and education for a career not requiring physical strength.

Is there wonder that our southern states lagged in the march of American progress? There have been numerous causes which held back the fuller development, only now beginning to open before us, of this which is naturally the most desirable part of our whole country, much of it valuable for its mineral resources, much of it fertile beyond imagination, all of it abounding in the natural advantages of forests and streams. The feudal agricultural system originally undertaken was outgrown even before the American Revolution; and abetted and was itself sustained by negro slavery, which worked its curse upon the land in so many ways. The Civil War, with the political reconstruction period, the fear of yellow fever and its occasional ravages, the constant menace of malaria, which killed or weakened all but the favored few who could command cinchona in the rich marshy districts; all these were factors. But among them uncinariasis stands with malaria as worse than war and the devastation of battles and worse than all the other pathogenic agencies in combination. Through the influence of one or both of these diseases the men and women of the south, bred from the best of American Colonial stock, offspring of pioneers, with the blood of English gentry and Continental cavaliers in their veins, sank lower and lower in physical degradation and squalor; were derided and denounced as lazy and shiftless, and condemned in popular opinion as a disgrace and worthless. But in reality their languor was not the product of the balmy breezes or the luxurious bounty of nature, as often charged. These people were sick; some died. They did not themselves know their true state, and in the

lethargy of the disease they were not interested enough to deny the wholesale charges against them. When spared by death and come to parenthood the sallow, hollow-faced weaklings created offspring who died or grew up in turn to inefficiency. Thus other races have died out in the history of the world. One can well fancy the actual curse of Rome to have been malaria and the old-world hook-worm; and the glory of Greece may well have faded from the same influences. So, too, the power of the Moslems and the Moors and of the Spanish conquerors may perhaps have died out in the fever of malaria and the puny pallor of uncinariasis.

If it be correct to believe that from one-fourth to one-third of our southern population have been infested in milder or severer degree, to what extent would this have influenced the wealth of the land, and how would it have affected the cultural life of the country? The natural wealth of the eleven states particularly included in the hook-worm disease is of course not impaired; that remains whether there be a population or none. But the annual return from human effort is impaired, not necessarily to full proportion of the ratio of infestment, since only the severest grades of infestment bring total individual incapacity and render the subject an immediate burden to his fellows, and because, too, the immediate depressing influence of infestment may be outlived even though its remote effects may be in some measure life-long. But it is probably not excessive to estimate that (instead of one-fourth or one-third deterioration in productiveness corresponding with the ratio of infestment) one-twentieth to one-tenth deficiency may be ascribed as the annual loss in acquired wealth to the general population. There have been many special factors operative within the past decade to advance the industries of the south, and progress which has been attained is notable throughout the south. The principal elements making to this advance are doubtless the fact that the exploitation of the west has neared its logical end and the opportunities of the South are naturally coming to the fore, and that the labor difficulties of the north

are resulting in an endeavor to find cheap labor among the whites of the south. Yellow fever has lost its terrors; and the secret of malarial transmission has taught us a ready mode of escaping it—and in some measure, too, the hook-worm curse is being lifted. But for the most part this progress is in the face of the hook-worm problem; and the industrial data of today should be influenced for the better by an addition of at least the proportion just claimed if the efforts toward eradication of uncinariasis become an accomplished fact. I leave here, too, as real but too complex for ready analysis, the sum total of general increase of wealth in the improvement of homes, of increase in fertility of the land by more efficient care, the value of better education bound to follow for the masses, and of the worth of the happiness, contentment and longer life which must follow elimination of the African curse. The annual crop of tobacco in the six tobacco states was estimated in 1908 at from $50,000,000 to $60,000,000; the rice crop, mainly of South Carolina, Louisiana and Texas, for the same year was valued at $17,750,000; the sugar crop at $30,000,000; the cotton crop, including both lint cotton and cotton-seed by-products for the same year, the enormous aggregate of $624,907,411; the more recent figures for corn and other cereals are unavailable to the writer, but the acreage is known to yield roughly about three-fifths of all farm crops, and in 1899 amounted to a total of $402,904,733, so that it is fair to hold that in 1908 the value was at least from $500,000,000 to $600,000,000; the hay crop alone, excluding all values of fresh grasses for forage and other forage crops, amounted in 1898 in the southern states to considerably over 10,000,000 tons, which at the low price of $14 per ton would add $150,000,000. As early as the census of 1899 the vegetable crop of the southern states was worth over $80,000,000, and since then has more than doubled; and no account is here taken of the $12,000,000 to $20,000,000 from the fruit and nut production. In the aggregate it is safe to estimate that the total annual agricultural production is well above $1,500,000,000 in the southern states. Since it is perhaps correct in such con-

sideration to exclude the live stock industry with its many millions of annual productive value for these states on the ground that the physical condition of the workers is not essential to the animal increase, I do so with full realization of its magnitude and the validity of at least some graded claim for inclusion. The lumber crop, however, requiring at all stages, from the cutting of the trees forward, the energies of human beings, should be included, amounting in 1910 to $440,000,000; so, too, the fisheries, producing in 1908 $18,500,000, and double that sum if oysters be added; and the mining products, amounting in coal alone in the southern states to over 50,000,000 tons according to the census of 1900, in the petroleum in 1908 to 75,908,329 barrels, in iron and other metals to a value of over $355,000,000 in 1910. The value of manufactured products in 1900 aggregated $1,860,000,000, and since then has nearly doubled; and a large part of this amount belongs to the cost of labor. And to all these the non-metallic products of mining, embracing stone, the cement and gypsum industry, the clay-working industry, phosphate production, sulphur, fluorite, mica, mineral paints, salt, as well as the production of gold, silver, lead, copper, mercury and the rarer metals; and the wage of the multitudes engaged in transportation and commerce and in the building trades must be added. All told, the annual production and the pay-roll mount well up to four or five billions of dollars. If this be true and the estimated deficiency from hook-worm of from five to ten per cent be approximately correct, it can mean nothing less than that in the present scale of conditions the southern states are annually losing an aggregate sum of money of from $250,000,000 to $500,000,000—to say nothing of the deterioration and death of the original American stock and the misery and suffering entailed.

Ordinarily one may appeal long for recognition and concert of effort to correct such condition of affairs; but the realization of their wishes came early to those who were concerned in the study of this disease in America. More than one paper earnestly urged the economic as well as the purely pathological importance

of the disease; but Stiles, soundly supported by the United States Public Health and Marine Hospital authorities, did more than all others together in fixing upon the public and the authorities the tremendous significance of uncinariasis. In 1901 and 1902 and 1903 the hook-worm formed the nucleus of a jest in talk and printed items; it was then the "lazy worm." The poor Southerner who harbored the worm was if anything incensed by the disgrace he felt was incurred by his becoming ignorantly its host. But as time and experience confirmed and added to the earlier warnings, the real meaning of the insidious enemy to the district fastened itself in the public mind; and the jest died away to be replaced by earnest consultations as to measures for elimination of the pest and the menace. Stiles early enlisted the hearty co-operation of the southern medical profession and of the Public Health authorities at Washington; and they in turn aided his efforts until the local authorities of states and counties and hamlets were moved. On October 26, 1909, one man wrote this letter to a selected group of men:

NEW YORK, October 26, 1909.

GENTLEMEN:—For many months my representatives have been inquiring into the nature and prevalence of "hook-worm disease" and considering plans for mitigating its evils. I have delayed action in this matter only until the facts as to the extent of the disease could be verified and the effectiveness of its cure and prevention demonstrated. The wide distribution and serious effects of this malady, particularly in the rural districts of our southern states, first pointed out by Dr. Charles Wardell Stiles, of the United States Public Health and Marine Hospital Service, have now been confirmed by independent observations of the distinguished investigators and physicians, as well as by educators and public men of the South.

Knowing your interest in all that pertains to the well-being of your fellowmen, and your acquaintance with this subject, I have invited you to a conference in the hope that it may lead to the adoption of well-considered plans for a co-operative movement of the medical profession, public health officials, boards of trade, churches, schools, the press and other agencies for the cure and prevention of this disease. If you deem it wise to undertake this commission I shall be glad to be permitted to work with you to that end and you may call upon me from time to time

for such sums as may be needed during the next five years for carrying on an aggressive campaign up to a total of one million dollars ($1,000,000).

While it would be a privilege to act in any movement which offers assurance of relieving human suffering, it is a peculiar pleasure to me to feel that the principal activities of your board will be among the people of our southern states. It has been my pleasure of late to spend a portion of each year in the south, and I have come to know and respect greatly that part of our country and to enjoy the society and friendship of many of its warm-hearted people. It will, therefore, be an added gratification to me if in this way I may in some measure express my appreciation of their many kindnesses and hospitalities.

Very truly,

JOHN D. ROCKEFELLER.

That letter, empowering a commission of scientists, educators and men of affairs to take up in earnest the struggle for the eradication of the hook-worm from America, has given the greatest and at the same time the most valuable impetus to the work; and the aid given by the commission to local efforts resulting in more and more public contribution, has bound the whole movement into a co-operative attack; and a statement of the work of this commission will best serve to make known the general plan of all who are engaged in the effort.

Theoretically there are three points of advantage from which to deal with uncinariasis. Were any one of them completely carried to success, the parasites would be destroyed and the disease eradicated. But the statement of a theory and the practical proof of a theory are not the same thing, because in practice one cannot with the readiness of thought eliminate conflicting conditions and retarding influences. These three things are in order: (1) The successful destruction of all parasites in every infested individual, thus saving the individual himself and at the same time excluding him from remaining indefinitely a further source of infestment for others; (2) the prevention of soil pollution by provision of proper closets throughout the infested district; and (3) protection against the invasion of the larval hook-worms from the soil into the

unshod feet by providing shoes which are to be constantly worn. The first of these measures is doubly advantageous in that it is curative for the infested individual and protective against dissemination. A number of effective and well-known remedies are employed for the expulsion of the parasites from the intestine. Of these thymol is the drug most relied upon, although recently chenopodium has been declared as equally or even more efficient. But thymol dosage may be followed by unpleasant and even alarming symptoms, and should never be employed except under supervision of a physician; and its use is never advised unless there be positive proof that the affection presented by any given individual is certainly uncinariasis. Mild cases may often be overlooked, and, especially in negroes and in strong white adults, the presence of small numbers in the intestine may not be suspected; and even in severe anemias in individual cases the cause may be by mistake attributed to hook-worms when really this is not the case. Final proof can be obtained only by recognition of the eggs of the parasite in the dejecta of the subject. It is not a matter of difficulty or much labor to properly trained workers to examine the fecal discharge; but the aggregate of the necessary examinations demanded for a thorough investigation in the field becomes enormous. Moreover, as one might well expect, objections may be encountered from the individual citizens to furnishing material for examination; and it is impracticable and often would be impossible to force such persons into compliance. In the earlier days of the survey both against local examiners and the field examiners of the Rockefeller Commission threats of violence were repeatedly made, an unpleasant experience which is fortunately much less frequent as the beneficent purposes of the examiners and the happy results of treatment of positive cases are being so uniformly proved to the ignorant and suspicious classes of the rural communities. That this is the case is proved by reference to the annual reports of the Rockefeller Commission; the number of recorded microscopic examinations for the first year of work (1910),

14,749; increasing in 1911 to 90,724; in 1912 to 326,951; and in the first three-quarters of 1913 (figures for the last quarter not being available), 797,440. Of course there are hundreds and perhaps thousands of physicians who are contributing in the same way in their private practices; but practically the whole population of 25,000,000 (at least all who are not dwellers in well organized cities with paved streets and thoroughly enforced sanitary regulations) is within the bounds of suspicion and should be examined were this the only measure to be prosecuted. Moreover, every individual who is found infested should, after treatment, be re-examined several times at intervals, to establish the thoroughness of removal of the parasites.

Realizing the magnitude of the task and the numerous chances of fault in the prosecution of this single line of operation, the commission has from the first conducted general sanitary surveys of the districts under investigation with the immediate purpose of stopping the pollution of the soil by surface deposit of infested feces. The data obtained by microscopic fecal examination have been employed most advantageously in arousing public attention to the matter, the proportion of infestment in a county being placed before the county officials, the school boards, church boards and the village authorities in order to obtain their co-operation. The results have interested physicians who might otherwise have neglected the subject, and have elicited their assistance. And when examinations are repeated after treatment of the positive cases, the further data appeal as indicative of the progress of the work toward eradication of the pest.

The sanitary survey work carried on side by side with the examination and treatment of patients is equally important with the preceding mode of diagnosis and treatment of individual cases; and from a communal standpoint is perhaps more promising of final success. This survey is planned and in practice is so prosecuted as to not only obtain information as to the existing sanitary condition of communities and private

homes, but also to give the widest information to the people upon general sanitation and the particular measures demanded locally. The inspectors investigate primarily the mode of disposal of excreta and have established the fact that in the southern country districts, particularly among the tenantry or "renters," over fifty per cent of the homes are either entirely unprovided with closets or, if these exist, that they are totally unfit to prevent scattering the fecal discharges over the surface, and that they serve rather as foci for soil pollution with the larvæ of hook-worms and other parasites, and as sources from which flies and other agencies of convection may spread typhoid bacteria and the microbic causes of a series of other important infections. They teach by conversation, lectures, lantern demonstrations and literature the importance of a proper closet and effective modes of construction. They inquire into water and food supplies and endeavor to impress measures of correction where needed; they teach the importance of screening of houses against flies and mosquitoes, and urge in the line of their original organization the importance of shoes in preventing acquirement of uncinariasis. Perhaps the lecturer does not personally reach every individual in the community visited; but those who are reached become teachers to their families and their neighbors; there is a notable influence, too, from the stimulation given the county and local health officers. Naturally, in this phase of the work as well as in the examination for hook-worm infestment of individuals, there were obstacles and difficulties—and not the least from jealous or ignorantly obstinate officials. But the work has progressed. The commission surveyed 125 counties in 1911; 183 in 1912, and in the first three-quarters of 1913, 450 counties; to which must be added important co-operation of many counties, more of which could not be reached within the period by the commission's staff.

However effective the wearing of shoes to prevent infestment (and this unquestionably is a credited measure), it is manifestly impossible to expect the commission or the general

public to provide shoes for the unshod throughout the south. This is a matter for individual provision and subject to individual inclination and appreciation. Even were shoes supplied to the multitude, there would be those who go unshod. To go unshod is by no means always due to the necessities of poverty; the call of the wild and the peculiar joy ingrown in the bare-foot boy will always keep many sometimes and some always from wearing shoes. The measure may be urged to its utmost and the thickness of the soles insisted upon until doomsday; there may be here and there, and for a time, flattering response; but in the end success will be only measurable, and the hook-worm will continue to live and kill.

In its organization the Rockefeller Commission, composed of fourteen individuals prominent in scientific, educational and general matters, adopted the state as the unit in its active work, and arranged to co-operate with the existing health authorities in each. At first nine states and later two more entered into such agreement, a director for the work being appointed in each state as a state official, reporting directly to his Board of Health and through the latter to the offices of the Commission in Washington, D. C. Under each director were appointed the necessary office staff, laboratory staff and field staff. In the preliminary infection surveys the field force make necessary microscopic examinations at once where they are stationed; but otherwise the bulk of the laboratory studies are made in the state laboratory by its permanent staff. The field force, too, actually treats the cases, organizing dispensaries for the purpose; makes sanitary surveys and instructs the people who come to the clinic for examination, treatment or through curiosity. At first the people, from lack of interest, pride or actual antagonism, gave little heed to the dispensaries and their physicians. They did not know hook-worms and were not prepared to take the matter seriously. They could with difficulty be persuaded to allow examinations to be made, and were even less ready to accept treatment when found infested. For at least two years the

educational work of the commission and of the health authorities of the states was directed to induce the people to recognize their own interests and the importance of the subject. But today, to quote from the report of the commission for 1911 (p. 21), "the people come in throngs; they come by boat, by train, by private conveyance for twenty and thirty miles. Our records contain stories of men, women and children walking in over country roads ten and twelve miles, the more anemic at times falling by the way, to be picked up and brought in by neighbors passing with wagons. As many as 455 people have been treated at one place in one day. Such a dispensary group will contain men, women and children from town and country, representing all degrees of infection and all stations in life. A friend who had just visited some of the dispensaries said to me recently, 'It looks like the days of Galilee.'"

How many cases in all have been treated cannot be told. Physicians from one end of the southern states to the other have treated great numbers; but the records of the commission speak volumes for progress and for its own effectiveness. In 1910 there were treated 14,423 persons; in 1911, 140,378; in 1912, 238,755; and in 1913 up to the close of September, 517,823—a total of over 900,000 individuals. And treatment, it must be remembered, when conducted with care and intelligence means cure (at least to all save those in the severest stages).

What, then, can be said of the result? What has been actually accomplished by this work, begun in the laboratory, urged and inspired by the devoted zeal of the zoologist Stiles, at first derided though soon attracting the munificence of the multimillionaire, finally engaging the interest and co-operation of the public officials of eleven states as well as of the Federal Government, and now prosecuted by a special corps of workers in each of these states and by the whole medical profession of the south? It is difficult to be specific in answer. The tremendous progress of the southern states in the last decade is due to so many potent factors that it is hard to specify the

effect of any one of these which are unclassifiable by material products peculiar to themselves. Moreover, whatever progress in the special connection here considered has been accomplished, it must be remembered is really only a beginning. Even if a million have been restored, there probably remain six or seven million more of infested ones, themselves afflicted and afflicting others. No actual statistics can be quoted, for the increase of the health of the individual among the multitude is too intangible, the increase of his earning capacity apt to be too closely interwoven in the records of trades, to be easily estimated. But vivid impressions are growing in the minds of those who are on the ground and in position to observe, and they all believe that the hook-worm campaign is actually accomplishing a general betterment. A physician, a graduate of our own medical school, now the head of the medical department of an important insurance company with a department of banking and loan to farmers in North Carolina, recently told me in conversation that the small farmers, with whom particularly he comes in contact throughout his state, are surely increasing in number and improving in their financial abilities, and that in his opinion one of the factors making for this benefit is the lowering of "hook-worm laziness." For the individual cases there can be no doubt of the reality of physical improvement. It is this which is attracting in greater and greater numbers to the dispensaries the people who believe themselves infested. The pale and sodden countenance and the apathetic indolence give way, in so brief a time that it often appears miraculous, to rosy hues of health and exuberant zeal; and the retarded children in a few months accomplish a physical growth and mental grasp of school problems of which they were utterly incapable.

A few specific examples, quoted from the reports of the commission, may impress you more than (and compensate for the lack of) the actual statistics I acknowledge I am unable to produce:

"The boy was about fifteen years of age when seen. His

father had heard his neighbors speak of the work that we were doing and had read the pamphlets and dodgers that we had sent out. His curiosity was aroused, and when he heard the results of the treatment given to two other boys in similar condition to his son, he determined to bring his boy to see me. The boy was a typical subject. His skin had cadaverous appearance, the membranes were almost white, and there was extreme lassitude and apathy. He seemed to take no notice of the crowd or the exhibits on display, and submitted himself to a physical examination with the most profound indifference. When the examination was completed he at once turned, without waiting to hear the diagnosis, and went to a log near by and sat down, apparently very fatigued. There were so many similar cases in the great crowd that pressed upon me that no further attention was given the boy except to caution the father as to treatment, explaining that I was giving him a small dosage and asking him to return for a second treatment, and let me know how the boy progressed. The case was forgotten until at a later dispensary the father came back to see me to pour out his thanks and tell me of the wonderful improvement. He said that the boy had always been of no account, worthless, trifling. He said that he regarded it as a case of laziness and worthlessness. He said that the boy would lie on the porch like a dog, day after day, apathetic. He could not be aroused to either work or play. The father said he could not believe that it was sickness, because whenever the bell for meals rang the boy was up, the first at the table and the last to leave, and ate more than the farm-hand. The boy responded at once to the treatment and picked up vitality in a remarkable way. He began to take interest in many things and to help with the work. The economic value of the treatment can best be presented just as the old farmer told it to me. 'Aside from saving my boy,' said he, 'this thing means money in my pocket. Before I saw you I had to feed and clothe him and care for him at a dead expense, and with no hope that it would ever be different. I had to hire a man

to take the work I had counted on his doing, which cost me $1 a day. Now I have figured this thing out this way: I am not only saved the dead expense of his doctor's bills and medicine, and all that, but I am saved the price of the hand which I have discharged, which is $1 a day, not for a day or two, not for one or two years, but for many years, until he is grown and leaves me to make his own way in the world. I consider,' he said, 'that this is the darnedest best investment I ever made.' And he began pouring out his thanks again. 'When I left home,' he said, 'that boy was following a plow and yelling at the mule in a way to let you know that he was just glad to be living.'" (From Second Annual Report of Commission, 1911; p. 115.)

A second quotation from the account of the administrative secretary of the commission, Mr. Rose, concerns a mining community in Kentucky. It was stated to Mr. Rose by Mr. W. L. Moss, vice-president and general manager of the Continental Coal Corporation, Pineville, Ky.:

"In June, 1911, there were in the company's camps about 150 cases of typhoid; cases of bowel complaint were numerous; hook-worm infection ran about sixty-five per cent; soil pollution was practically universal; the wells and springs were contaminated; flies had free range. Dr. McCormack, Dr. Lock and Dr. Hendren, the camp physician, urged reform. Mr. Moss secured from his board of directors an appropriation of $25,000 for sanitary improvement; all open wells and springs were filled up; deep wells from eighty to ninety feet deep were bored, protected, supplied with pumps; 400 new sanitary closets were built and hundreds of old closets were made over. During the summer of 1912 and up to the time of my visit (October, 1912) there had not been a case of typhoid in the camps; cases of diarrhea were reduced to about half; the cases of hook-worm disease have been treated. From June, 1910, to June, 1911, the force of about 1,800 men on the company's pay-roll put on the cars about 600,000 tons of coal; from June, 1911, to June, 1912, the same force put on

the cars a fraction over 800,000 tons of coal. Mr. Moss stated with emphasis that merely as an economic proposition this $25,000 is the best investment the company has made." (From Third Annual Report of the Commission, 1912; p. 20.)

These are isolated instances, it is true, but they are duplicated in every section of the south where uncinariasis prevails; and such examples are multiplying the numbers of applicants for relief and instruction wherever the hook-worm campaign is placing the clinics and dispensaries; and perhaps in them you may be willing to see the coming of the ultimate success in the attempt to eradicate the African vampire.

There has been no period in the history of the world in which in the same time a greater number of notable accomplishments in science, invention, exploration, exploitation of natural resources, and in government have been reached than in the past two or three decades. Medicine has contributed its share. The discovery of the cause of malaria and the solution of the mystery of its transportation by mosquitoes, the demonstration of the mode of infection in yellow fever, the application of these principles in the prevention of scourges in Panama during the period of canal construction, in the cleansing of Havana and in the actual subjugation of an epidemic of yellow fever in New Orleans; the wresting from typhoid fever its terrors by vaccination in our American Army; the discoveries in chemotherapeusis, notably of syphilis by Ehrlich—these and many more are epochal in their importance and their future significance. Among accomplishments of this type should be placed the history of American uncinariasis; its discovery, the quick apprehension of its significance, the persistent vigor with which the problem has been assailed, the great-hearted benevolence of a multimillionaire whose name has been traduced in print and in speech as a veritable genius of evil, the intelligent application of the great fund thus contributed, and the organization of scattered public health forces into harmonious co-operation by the central commission, and the evidence of the benefits accruing to every

sufferer reached and to the public as a whole—all these form chapters of almost fabulous interest. Can you wonder that American medicine accounts this work as a great achievement, or that I confess for those of us who have taken part at one stage or other of the work, that we are proud of our association with the men who are doing this great thing and those who have made the doing possible?

THE AMERICAN NOVEL—PAST AND PRESENT

By Arthur Hobson Quinn
Professor of English and Dean of the College
University of Pennsylvania

The attempt to discuss this subject in one hour may seem at first glance to invite disaster. It is not my purpose, however, to treat in detail the work of any novelist, but rather to show the main tendencies that have been manifest in the development of the novel in this country, and to call attention to its significance in connection with the growth of national life and national literary taste.

We cannot claim for the American novel dignity of ancestry or distinction of birth. The American short story, beginning with Irving, gave the world a new literary form, but the first American novel was the feeble imitation of a second-rate English mode. *The Power of Sympathy*, published anonymously in Boston in 1789 and attributed to Sarah Wentworth Morton, a local poetess of otherwise blameless reputation, is the first novel written in America by an American. *The Power of Sympathy* came at a dead time in the English novel. The great age of its beginning, after witnessing the work of Defoe, Richardson, Fielding, Smollett, Sterne and Goldsmith, had closed in 1771 with Humphrey Clinker, while Scott and Jane Austen were still in the future. In the meantime, the sentimental novel of intrigue was having its swing and Mrs. Morton transplanted it to this soil. *The Power of Sympathy* deserves little notice upon its own merits. Its plot is negligible and its characters are sticks, while the purely gratuitous scandals introduced by its author are nauseating.

The next novelist, Susanna Haswell Rowson, was born in England, but her life was so largely spent in this country that she is usually included in any treatment of our fiction. She produced a number of novels, was an actress in the old Chest-

nut Street Theatre Company and a playwright. Her most famous story, *Charlotte Temple, a Tale of Truth* (1790), has been many times reprinted and in dramatic form still holds the boards. It belongs to the same general type as Mrs. Morton's novel, but is not so poor as that production. Charlotte Temple, the heroine, was for many years the type of the beautiful but badly treated angel on whose devoted head sorrows were poured with no stinting hand. Her adventures formed a "horrible example" for half a century to warn susceptible young women of the terrible dangers that lay in wait for them if they yielded to the seductions of a scarlet coat.

More significant than either of these writers was the work of Hugh Henry Brackenbridge, a native of Pennsylvania, whose satirical romance, *Modern Chivalry, or The Adventures of Captain Farrago and Teague O'Regan* (1792), is the first novel to bear the real savor of the new world. This romance, based on *Don Quixote*, gave Brackenbridge an opportunity to make fun of many institutions in Pennsylvania, among them our own University. There is a racy quality in the style and a reality of description which preserve interest in this story even today.

So far the novel had been tentative and sporadic. In the work of Charles Brockden Brown, of Philadelphia, the note struck became much more definite. Brown was the first professional man of letters in America. He had a fictional philosophy and by a combination of romantic selection of material and a realistic portrayal of events he produced a series of novels which, whatever their limitations, are interesting and at times absorbing. It is a commonplace of criticism to speak of him as belonging to the Gothic School of Romance, of which Horace Walpole and Mrs. Radcliffe were the leaders in England. He was slightly affected by their methods, but he was more distinctly influenced by Godwin, the English socialist, whom he in turn affected. Brown's imagination was powerful, and he is greatest when he lets his power create abnormal characters and situations which, impossible as they

may be, live in our memories. Whether it be the mysterious voices in *Wieland* (1798), the death struggle of Constantia and Ormond in *Ormond* or the mingled sociology and sleep-walking of *Edgar Huntley* (1799), there is always the suggestion of power. Striking at times is his ability in realistic description. The yellow fever epidemic in Philadelphia of 1793, described in *Arthur Mervyn*, had to wait for a better treatment until the publication of Dr. Mitchell's *Red City*, only a few years ago.

Interesting, historically, as the beginnings of the novel are, it is in Cooper's work that we first find the artist who approached the great note. He secured his romance, not by the method of Scott, who searched among the striking events of the Middle Ages for his material; Cooper departed from actual life by placing his characters in a primitive condition of society, or by placing them among the unusual conditions of the sea. The outworn machinery of romance he discarded—as he said in the preface to *Lionel Lincoln:*

"No dark-looking stranger of a morbid temperament, and of inflexible silence, has ever transmitted to him (Cooper) a single page of illegible manuscript."

Cooper struck in 1821 with *The Spy* the flood-tide of that romantic impulse which had swept over Europe at the close of the eighteenth century. In romantic idealistic work of the type that Walter Scott and Cooper wrote what is needed is a selection of a few simple elemental passions and motives, made real by being placed in the bodies of live people and made interesting by the events that they bring about or by which they are caused. No minute characterization is demanded—everything is put on with a brush, and the popularity of the novel seems to grow in proportion to the lack of demand upon the brain tissue of the reader. I do not mean by this to belittle in any way the work of Scott or Cooper. If it were easy to write great romantic novels more great ones would have been written. It is true also that it is not by any means due only to the comparative ease with which they are read that they are so popular. It is just because they deal with

the elemental passions, love, hate or revenge, because they deal with the most obvious sentiments, such as patriotism, loyalty, pity and terror, and avoid self-torturing introspection or conscientious struggles, that they appeal so universally. Cooper has to his credit, moreover, the development of three types of romance: that of the Indian trail, that of the Revolution and that of the sea. Smollett had written of the sea, it is true, but it remained for Cooper to visualize the sea fight and to plan those majestic movements of the fleet in action in which he has not been surpassed. That he struck a new note in romance is evidenced by the fact that his work was translated into practically every civilized European tongue and was published in thirty-four different places in Europe. Balzac said of him, "If Cooper had succeeded in the painting of character as well as he did in the painting of the phenomena of nature, he would have said the last word of our art."

Cooper founded a definite school, and in two at least of his followers he found worthy imitators. John Pendleton Kennedy, of Baltimore, the friend of Poe, produced three romances, *Horse Shoe Robinson*, *Rob of the Bowl*, and *Swallow Barn*, all well worth reading. William Gilmore Simms, of South Carolina, did even better work. His romances of the Revolution, such as *The Partisan* and *Katherine Walton*, preserve pictures of Southern life of great value, while in his Indian romance of *The Yemassee* he rivaled Cooper on his own ground.

Just as Cooper's Romance of the Primitive marked an advance upon Scott's Medieval Romance, so in Hawthorne's Romance of the Moral Life we find the search for the strange and the new leading a great writer into those recesses of our being in which dwell the thoughts that banish sleep. In Hawthorne's romance of sin and its effects we find a series of studies of the human conscience. In *The Scarlet Letter* it is through Dimmesdale's conscience that Chillingworth drives him to despair; in *The Marble Faun* Donatello's crime turns him from a happy, light-hearted animal into a human being, raised in the scale of life by the awakening of his moral nature.

Hawthorne thus escapes from the life around him by leading us into a kind of abstract existence, the domain of the moral life. In this shadowy land things may happen which our reason tells us are impossible, but in the hands of a magician we surrender our private judgment and it is the real world that seems the dream.

To tie this abstract life to actuality in some degree, and to satisfy the desire of the average reader for what is concrete, Hawthorne frequently uses a striking symbol. It is this grip of the concrete which accounts for the longing we have to know what is behind *The Minister's Black Veil*, which explains the hold that the mystery of *The Birthmark* has upon our sympathies, and which accounts in large measure for the appeal of the supreme creation of our native romance, *The Scarlet Letter*. Many and various are the thoughts it suggests, the sidelights it throws upon human nature, the ways in which it links the supernatural to the natural.

Hawthorne suggests delicately the effect the letter had upon Hester Prynne, upon Arthur Dimmesdale, and upon the people, and then in the following passage describes a dramatic relation between the sinner, the effect of the sin and the symbol of the sin, unsurpassed in English literature:

"But that first object of which Pearl seemed to become aware was—shall we say it?—the scarlet letter on Hester's bosom! One day as her mother stooped over the cradle, the infant's eyes had been caught by the glimmering of the gold embroidery about the letter; and, putting up her little hand, she grasped at it, smiling, not doubtfully, but with a decided gleam that gave her face the look of a much older child. Then, gasping for breath, did Hester Prynne clutch the fatal token, instinctively endeavoring to tear it away; so infinite was the torture inflicted by the intelligent touch of Pearl's baby hand. Again, as if her mother's agonized gesture were meant only to make sport for her, did little Pearl look into her eyes and smile."

The art of Hawthorne is shown in the way in which he

evolves a dramatic, almost supernatural significance from the natural actions of a child. Normally, the baby would, of course, have noticed, first, yellow and, second, red, and while Hawthorne nowhere obtrudes the basic probability of his events upon us, it remains one of the greatest sources of his strength.

Sometimes, too, he evades the responsibility for the supernatural by introducing it as a tradition. One of the most interesting examples of this method of introduction, which shows also his thorough knowledge of New England's past, lies in an incident in *The House of Seven Gables.* Colonel Pyncheon has been instrumental in having an old man, Matthew Maule, persecuted as a wizard, and has taken some property which belonged to Maule. Maule curses him on the scaffold, prophesying that "God will give him blood to drink." Of the death of Colonel Pyncheon, Hawthorne writes:

"There is a tradition, only worth alluding to as lending a tinge of superstitious awe to a scene perhaps gloomy enough without it, that a voice spoke loudly among the guests, the tones of which were like those of old Matthew Maule, the executed wizard, saying, 'God hath given him blood to drink!"

Hawthorne derived this idea from Robert Calef's *More Wonders of the Invisible World,* which was published in 1700, as a reply to Cotton Mather's *Wonders of the Invisible World.* At the trial of Sarah Good, one of those accused of witchcraft, Calef tells us one of the magistrates, Noyes, urged her to confess, saying she was a witch. She replied:

"You are a liar—I am no more a witch than you are a wizard and if you take away my life, God will give you blood to drink."

The fact that one of the judges, Mr. Hathorne, was a direct ancestor of the novelist, makes the incident even more interesting. It is, however, only one of many which show the essentially native quality of Hawthorne's genius. He was the logical outcome of the Puritan's interest in the supernatural, and he could have been developed only in New England.

Farther than the refinement of spiritual quality that is Hawthorne's, the romance could not well go. He marks its culmination and it will be seen that the development of the novel in America up to the Civil War was largely in the direction of romance. But already the reaction toward the story of familiar life had begun. In Dickens, Thackeray and Bulwer, the way for it was pointed out in England and under the influence of George Eliot it became supreme.

In America the progress toward the later realism was bridged by a number of writers who may be called transitional. The material they use is largely that of life before the Civil War, but their method points forward. All of them but one wrote after 1860. This transitional group consists of Harriet Beecher Stowe, Bayard Taylor, Mark Twain, Bret Harte, Oliver Wendell Holmes and Thomas Bailey Aldrich.

Uncle Tom's Cabin is now a part of our national history, but read in cold blood at this time it leaves us with a sense of wonder that it achieved such a success. It is not only poorly written compared with Mrs. Stowe's later novels of New England life, like *Old Town Folks* or *The Minister's Wooing*, but it is based on an essential falsification. The dramatic appeal of the book depended on the tragic situation in which one part of the human race had power of life and death over another part. In order to heighten this tragedy it was necessary for the two races to be as nearly equal as possible, and Mrs. Stowe deliberately lowered the white race and idealized the negro race in order to accomplish this result.

Bayard Taylor, like Mrs. Stowe, began his career with a novel written for a purpose. *Hannah Thurston* might be read now as an anti-suffragette document, for it seems to be the earliest. He did his best work, however, in such a novel as *The Story of Kennett*, in which the pure interest of the story is triumphant. Mark Twain won his distinction in another department of our literature, but in one of his novels, *The Gilded Age*, written in collaboration with Charles Dudley Warner, he created a character that belongs to our permanent

gallery of portraits, the arch optimist, Colonel Mulberry Sellers. The novel was evidently intended to be *the* great American Novel, for the scene shifts from Tennessee, Missouri, Washington, New York and Pennsylvania to other places, but the formlessness of the plot prevented it from arriving at real greatness.

The novels of Oliver Wendell Holmes were an expression of the scientific spirit in literature and are all studies in heredity. The greatest of them, *Elsie Venner*, is powerful at times, but Holmes' real strength lay in a different field. The same is true of Aldrich. One is charmed by the style, but the fictional interest is not lasting, with the possible exception of *The Stillwater Tragedy*.

Another writer who might be said to belong to the transitional group, won his eminence in the field of the short story. Bret Harte wrote only one novel, strictly speaking, that is *Gabriel Conroy*, and it was not in the same class with his short stories, such as "The Luck of Roaring Camp." The relatively small amount of his novelistic work, therefore, takes him out of our survey, and the limited extent of his literary work in any direction makes it necessary only to mention Lew Wallace, whose *Ben Hur* is in every respect a great novel.

After the Civil War the novel and the short story became the prominent forms of literary expression. William Dean Howells, Henry James, Elizabeth Stuart Phelps Ward, F. Marion Crawford, S. Weir Mitchell, George W. Cable, Thomas Nelson Page, James Lane Allen, F. Hopkinson Smith, Margaret Deland and Edith Wharton form a group not to be matched by the poets or essayists of this period. Many of these writers have also been poets or essayists, but without exception they owe their fame either to their novels or to their short stories. The body of work written by these men and women is large and classification is difficult, while chronology is useful but not absolute. Some of these novelists have stood for certain definite forms of fiction; Mr. Howells represents the novel of average American life; Mr. James the international

novel; Mrs. Ward the religious novel and the novel of spiritualism; Marion Crawford the cosmopolitan novel; Dr. Mitchell the historical romance and the psychological novel; Mrs. Deland the novel dealing with moral issues and Mrs. Wharton the novel of social satire; while Mr. Cable and Mr. Page represent the romance, partly historical but definitely idealistic in its treatment of a vanishing civilization. James Lane Allen stands for another form of idealistic romance which defies brief classification and of which I will speak in a few moments.

A word here concerning the literary terms I have been using. One frequently hears the terms "romance" and "realism" spoken of as if they were mutually exclusive terms, but a consideration of the novelists I have just mentioned shows how misleading this conception is. A writer may be a romanticist and also a realist. The first term has to do with the selection of material and the second with the method of treatment. The proper antithesis of "romantic" is "classic." The romantic writer selects his material from that which is strange and new, different from ordinary life; the classic artist selects his material from that which is familiar, either on account of its age or on account of his knowledge of that material. He may treat this material, however selected, so as to produce the impression of actual life; that is, he may use the method of the photographer. On the other hand, he may treat his material so as to accentuate one phase of it to the subordination of others and produce types of character rather than individuals; in short, he may use the method of the impressionist. In the first case he is a realist and in the second an idealist. I believe much less confusion would arise in our literary discussions if the proper meaning of these terms were observed. We would then understand how both Mr. Cable and Mr. Page are romantic writers, but that one is a realist and the other an idealist. It is true, of course, that the romanticist is more likely to be an idealist than a realist because his material leads him to the production of types, and the classicist is likely

to be a realist because his very selection of familiar life leads him to attempt to produce an accurate picture of that life.

With the work of Henry James and William Dean Howells the classic realistic reaction became apparent. The influence of Flaubert and Balzac shows definitely in the work of Mr. James, but according to Mr. Howells' own statement, he developed his realistic manner before he became acquainted with the Frenchmen and his realistic attitude may be said to have been authorized rather than suggested by French influence. Later on Turgenev and Tolstoi were influences that helped to establish the realistic school, but a close student of the work of Mr. Howells and Mr. James will see also the influence of George Eliot, although this influence is not emphasized by either of these writers in their literary acknowledgments. Both Mr. Howells and Mr. James published their first novels in 1871, although both had written prose in a briefer form before that year. In this first novel of Mr. Howells, *Their Wedding Journey*, he created the characters of Basil March and his wife Isabella, who represent the educated American man and woman without wealth or marked social distinction. Through Basil March as a mouthpiece, Howells represents in a number of his novels the opinions of the average American man, sane, progressive, a bit unenthusiastic, possessed of great moral courage, unabashed before pretense of any kind and an American to the core. When he comes in contact with European civilization, he is not overwhelmed, nor does he take the attitude of Mark Twain. After some experimenting with Italian and American types and with the novel of travel and international relations, Mr. Howells commenced that series of realistic studies of native American life which are his main claim to consideration. He created in *A Modern Instance* in 1882, the young and unscrupulous American journalist, Bartley Hubbard, who failed on account of his inherent dishonesty, and in 1885 he wrote his masterpiece, *The Rise of Silas Lapham*. This is a study of the American self-made man, no ordinary hero, but a plain Ameri-

can, who has fought and succeeded in business, who is vulgar, too, in his attitude toward the thing he has done, but yet in whom there is a fine grain of honesty which brings him through a difficult situation with his own self-respect saved. The quality that saves him is the quality of self-reliance. It is a question whether in any other civilization than our own the stage driver would have developed that self-reliance which enabled him to fight out the great fight alone. This novel, too, may be looked upon in some ways as an epic of American business life—the answer to the European taunt that we are a nation of shop-keepers. It was the very greatness of Lapham's financial success that, by causing him to take a large view of things, made him act a large part in the hour of trial.

To these two types Mr. Howells now added that of the noble American woman, Lina Bowen, in *Indian Summer*, the penetrating study of the artist, Beaton, and the parvenu, Dryfoos, in *A Hazard of New Fortunes*, the clergyman, Sewell, and the country boy, Lemuel Barker, in *The Minister's Charge*, and two such contrasting types of the American girl as Alice Pasmer, in *April Hopes* and Bessie Lynde in *The Landlord at Lion's Head*.

It is not to be understood that Mr. Howells has confined his treatment to the middle class. He treats of all classes of American society, but he chose for his keenest satire the class that rose to social prominence after the Civil War, owing to the commercial expansion caused by the discoveries of new wants, the increase in manufactures and the general readjustment of conditions which came after the war. It will be an interesting period for the social historian when we get far enough away from it to view it accurately, and Mr. Howells' novels will then serve as a valuable adjunct to that social historian. It was not satire alone, however, that secured Mr. Howells his audience, it was his really deep insight into certain phases of human character, his careful study of human emotions, of human purposes and motives, his kindly tolerant attitude toward mankind, the probability of his events and

characters, and the art with which his plot, slight as it often is, works out logically and inevitably to the destined end.

Mr. James stands for the international novel in contrast to Mr. Howells' novels of American life. He is a great contrast to Mr. Howells in his attitude toward his audience. Mr. Howells' touchstone of success lies in his appeal to the great mass of intelligent readers. Mr. James' standard is his own private satisfaction. This leads to mannerisms and peculiarities, since they are perfectly right by the self-constituted standard and in process of time become the standard itself. This peculiarity of standard is paralleled by his indirectness of method. He is interested, not so much in individuals as in the relations of individuals or of types and nationalities. These characters or types are developed by what other characters or types say about them or think about them, not so much by what they themselves say or think. This indirectness of method and expression becomes most apparent in his later work, which is, therefore, less significant than the novels produced in the middle of his career. In his earliest period we find stories such as *Watch and Ward*, *The Bostonians*, and *Washington Square*, in which Mr. James treated American life, but these stories again are not so important as his studies of international relations.

He began in *Roderick Hudson* a long list of such narratives, short and long, in which American characters, manners, customs, modes of thought, standards of taste and sense of honor are brought into contrast with European standards. We find the young man of leisure in Rowland Mallett in *Roderick Hudson;* the American business man in Newman in *The American;* the artist in Roderick Hudson himself; the man of letters in Strether in *The Ambassadors;* the flashy journalist in Flack of *The Reverberator;* the commonplace yet pretty girl in Daisy Miller; the more refined type of American girlhood in Isabel Archer in *The Portrait of a Lady*, and, of course, the transplanted American like Gilbert Osmond in *The Portrait of a Lady* or Selma Barrington in *A London Life.*

The most distinct of these characters are the ones that it is most unpleasant for Americans to contemplate as representatives, and there can be no question that in pitting Christopher Newman against the society of the Faubourg St. Germain or in holding up Daisy Miller as a type of the American girl abroad, Mr. James has committed an essential unfairness. In reading Mr. James' novels one longs for a few Americans who are sure of themselves, men who have played some part in affairs or in intellectual life, but one looks for them in his pages in vain. From about 1886 to 1900 Mr. James devoted himself largely to the treatment of English life in such stories as *Princess Casamassima*, *A London Life*, *The Tragic Muse*, *What Maizie Knew* and *The Awkward Age*. It cannot be said that he represents English life any more favorably than he does American life. He furnishes the English with more surety of social standards, but he certainly endows them with more vagaries of moral conduct. What makes us regret the more Mr. James' limitations, and among these should be mentioned his singular lack of power in representing the emotional side of his characters, are the distinction of his style and the fineness of his character drawing. In his really great books, such as *The Portrait of a Lady* and *The Tragic Muse*, there is no American novelist that surpasses him in these two phases of his art.

Even before Mr. Howells and Mr. James had established the realistic novel of familiar life as the leading literary mode of this country, at least one writer had begun to explore other fields, in the search for romance. Elizabeth Stuart Phelps began her career in 1864 with a story, *Gates Ajar*, in which she attempted to reveal the future life as viewed from the standpoint of New England orthodoxy, modified by the influence of liberal ideas and by such contemporary speculations as spiritualism. While she is romantic in her selection of material, her description of the next world is realistic in the extreme. The book was written to help the women whose dead had fallen in the Civil War and the effect upon native and foreign readers seems to have been widespread. The Unitarian chill was

passing over New England religious thought and feeling when Mrs. Ward was born and it had reached its climax just before her birth, but she belonged by inheritance to the other wing, so that her work may be looked upon in some sense as a reaction. It was based definitely upon emotion; emotion that liked to be analyzed and worked out; emotion with a New England consciousness of itself. Emotional, too, is her treatment of social conditions in such a novel as *The Silent Partner*, which she wrote in 1871 to help in the betterment of economic wrongs. The tragedy in this novel is strikingly well done. But perhaps better than her novels of reform, her historical novels or her studies of the artistic temperament such as her *Story of Avis*, is her powerful delineation of the character of Emmanuel Bayard in *A Singular Life*. The main character is nobly conceived and the book is a better plan for muscular Christianity than any of the novels of Kingsley.

Just as Mrs. Ward stands for different phases of the novel, so does Dr. Weir Mitchell. In the first place, he stands for the psychological study of character, especially as affected by circumstance and heredity. It is only natural that the first nerve specialist in this country should have been interested in problems of character, and this interest accounts for his remarkable studies of women such as Constance Trescott, Octopia Darnell in *Roland Blake*, or Lucretia Hunter in *Circumstance*. Dr. Mitchell's women are not by any means alike or colorless, nor are they simply studies—they are real flesh and blood. In these three novels, as well as in *Characteristics* and *Dr. North and His Friends*, the scientific basis of Dr. Mitchell's work is shown in the keen observation of mental characteristics. These studies of character are combined at times with a historical background, as in *Roland Blake*, *In Wartime* and *Westways*, in which Dr. Mitchell painted with a master hand the cultivated American just before or just after the Civil War, whom Mr. Howells rather neglected and whom Mr. James seemed to forget. The people are nearly always gentlefolk. There is a provincial note sometimes, but more

frequently there is a note of the great world, of those who have seen other civilizations and remain content with their own inheritance of culture. As George Meredith, who read *Roland Blake* three times, said, "There is a certain nobility about it," and this remains characteristic of Dr. Mitchell's work. It was Dr. Mitchell's thorough acquaintance with social values that led him to say in *In Wartime*, "There are delicate overtones of unselfishness which belong only to the purest and sweetest natures refined by the truest good breeding. They are of the very poetry of social conduct."

While Dr. Mitchell believed that *Constance Trescott* was his best constructed story, his romances of history, such as *Hugh Wynne* and *The Adventures of François* have had the widest popular appeal. Dr. Mitchell had certain theories concerning the writing of historical novels which are to be found in *Dr. North and His Friends*, chapter sixteen. He has accurately followed these theories in his careful study of the social conditions of the times of which he writes and in his avoidance of actual historical personages for the central characters. His knowledge of American history is remarkable; his insight into character of the eighteenth century even more so. One feels as one reads *Hugh Wynne* or *The Red City* that the very streets are real. This reality may be due somewhat to the permanence of social conditions in Philadelphia, which has suffered less change from foreign immigration than any other American city. But it was only a great novelist who could have taken the facts of history and with a stroke of the pen turned them into life. The characters of Washington, Arnold, Hamilton, Jefferson and Randolph stand out as they never do in the pages of history. Dr. Mitchell has not made a demi-god of Washington. He has shown him as he was—a Virginia hunting squire who swore heartily, had a violent temper, was not above a risqué story, but who was, on the other hand, a character waiting only the opportunity to rise to greatness.

The Adventures of François, which, to quote Dr. Mitchell, was "the book of my affections," is noteworthy through the

wonderful character study of the thief in which the soul of a gentleman lies hidden. The book does not stand out so prominently as *Hugh Wynne* perhaps, but just as we have to go back to *The Spy* of Cooper to find a rival for *Hugh Wynne*, so the wonderful realistic scenes in the early part of *François* take us back for comparison to the founder of the English novel, Daniel Defoe.

To be a great novelist one must have almost equal ability at narrative and description, and Dr. Mitchell was possessed of this double power. Read, for one, the nineteenth chapter of *Dr. North* describing the passage of St. Clair through the cobra den, or for the other, the ninth chapter in *Hugh Wynne* when the hero meets Arnold and his wife in London.

The combination of romantic material with realistic treatment is well illustrated in the work of Marion Crawford. He stands for the cosmopolitan novel, both historical and contemporary. He wrote forty-five novels, only seven of which were historical, but in his interesting study, *The Novel, What It Is*, he shows clearly the basic principles on which a historical novel should be written. As he truly says, "No author can make Julius Cæsar, Mary Stuart or Louis XIV ridiculous, but no writer should forget that they can make a laughing stock of him in his book almost as easily as they could have done in real life."

It was partly his great knowledge of history which made his romances, especially *Via Crucis*, remarkable, but it was principally his imagination which created living men and women under the names of historical characters and also under fictitious names. And it was his imagination which could survey the gathered facts in a broad and general way and fuse them into those admirable descriptions of the movements of social progress or decay which illuminate the pages of his romances.

Of his modern novels, while the group dealing with Italian life is most important, they are all interesting. And here again it is the sense of Crawford's knowledge of his material which makes his work significant. One feels that he has a

grip on the complex life of Europe, and certainly it would be hard to find a country of Europe in which a scene of his stories has not been laid. He had no moral lesson to teach, and he believed it was a mistake to have any. But it was not a trivial view of life that Marion Crawford took; it was a wise, sane and cosmopolitan outlook, based upon experience and observation. His observation bore fruit in his power of description, which was truly remarkable. He could describe individuals or sketch a state of society, as in the *Saracinesca* series, or compare civilizations like those of the Persian and the Semite in *Zoroaster*, could paint delicately the growth of an emotion, such as the coming of love, in *Pietro Ghisleri*, or describe the progress of an idea or a principle through centuries, as in a striking passage in *Via Crucis*.

"Mankind moves westward with the sun; men's thoughts turn back to the bright East, the source of every faith that moves humanity; at first, for faith's sake, men may retrace their migration to its source and give their own blood for their holy places; and after them a generation will give its money for the honor of its God; but at the last, and surely comes the time of memory's fading, the winter of belief, the night of faith's day, wherein a delicately nurtured and greedy race will give neither gold nor blood, but only a prayer or a smile for the hope of a life to come."

Writing as much as he did, he could not always be upon the same level, but his great inventive power, his sense of "the story in it," his belief in clean, hearty, happy romance, his thorough grasp of his material, his wide, liberal view of all things, entitle him to rank with the great story-tellers of our age.

Among the writers of romance in this period there are four who are similar in certain phases of their work and yet differ in others. George W. Cable, Thomas Nelson Page, F. Hopkinson Smith and James Lane Allen all belong to that group which have taken their themes more especially from the South, or at least have won distinction by their work that treated of

Southern character. But there is a more essential likeness between Mr. Page and Mr. Smith than this. They are both romancers and they are both idealists. That is, they search for certain interesting incidents and striking scenes and they place among these scenes characters that are more or less types, like the hero of *Colonel Carter of Cartersville* or Jonadab Leech in *Red Rock*. They are not purely idealists, of course, they could not help being affected by the realistic school, but nevertheless one feels a certain tendency, especially in the case of Mr. Hopkinson Smith, to let his characters become ideal. Mr. Cable's work is more decidedly realistic so far as his characters go, while Mr. Allen's progress in this respect needs an especial word of explanation.

Mr. Cable was the first of this group to publish, beginning in 1879 with *Old Creole Days*. His first novel, *The Grandissimes*, appeared in 1880, the year of the publication of *The Stillwater Tragedy*, *The Portrait of a Lady*, *The Undiscovered Country* and *Ben Hur*. This first work of Mr. Cable dealt with the more romantic phases of Creole life, dating from the early years of the century, and in 1881 he added a novelette, *Madame Delphine*, which for pure tragedy, he never excelled. His later work, while significant, hardly has the quick appeal of his first stories, although his novels of the Civil War are based on actual experience in the Confederate army, and in *Bonaventure* he described an idyllic life in which he has had no competitors. As late as 1902 in *Bylow Hill* he gave evidence of ability to write a tragic story in a New England atmosphere, but after all it is for his pictures of Creole life that he will be remembered. It was a proper choice for a novelist. A people romantic in temperament, passionate, hot-blooded, placed in a position of power over life and death of a subject race—this condition would naturally develop a number of dramatic situations. Mr. Cable has shown how such stories as *Madame Delphine* seize upon these dramatic points and treat them with a permanent literary form.

His work is a compound of romantic material and realistic

treatment. He might, had he been an idealist, have created more of a sense of mystery and terror—but he is not an idealist. Not wishing to write a polemical tract as Mrs. Stowe had done, he did not have to idealize the negro or to degrade the white. But slavery is not his most significant theme; others had written on slavery. In his search for new material for romance, he selected the Creole race and the picturesque life it led before and after the cession of Louisiana. The very name is romantic and the circumstances of their descent, largely from adventurers of French and Spanish blood, and of the development of customs and institutions so different from ours tends to romance. Here was a contrast between a few strong ruling characters and a large unthrifty population, which enjoyed freedom from responsibility as its greatest blessing, a race living contentedly an unsanitary life—with a shadow of dread in the yellow fever always over it—a loyal, tender, revengeful, unreliable race; in short, a Latin race with its energy toned down by climate and years of irresponsible power over a subject people.

Mr. Page and Mr. Smith have both excelled in the short story and there are those who believe that the former never struck a higher note than he reached in 1884 with his stories—or, as he prefers to call them, novelettes—*Mars' Chan* and *Meh Lady*. If they are to be included in a treatment of his novelistic work they must take the palm, for surely the theme of loyalty and truth, of personal devotion beside which the gates of death are but incidents have rarely received such artistic treatment as in those two stories.

But of all his novels, *Red Rock* is the one that appeals the most. In this story he had a great subject, the South in the terrible days of Reconstruction, when a brave people, who asked only to be let alone with their great problem, were driven to desperation by the kind of politicians whom Mr. Page has painted so vividly in the character of Jonadab Leech. The story throngs with well-drawn characters: Blair Cary, Jacquelin Gray, Miss Thomasia, Steve Allen, Dr. Cary, Gen-

eral Legaie, Ruth Welch, Larry Middleton, form a gallery of portraits of mingled Southern and Northern origin, which would carry a much longer novel. Much better than any historical treatise could do it, *Red Rock* fixes upon a permanent canvas a picture of vanished civilization and a national crime. What impresses the reader most is the author's restraint. With his traditions and sympathies he might have been pardoned if he had laid the colors on more thickly, but he has preferred writing a novel to producing a political tract.

The novels of Mr. Page are interesting as a representation of the democratic attitude so different from that of Mr. Howells, which consists in painting deliberately the middle class in American life. Mr. Page's democracy starts with a certainty of inheritance and cultivation which allows a hero to disregard artificial social restrictions and meet every man on the basis of his own worth.

Mr. Hopkinson Smith's versatility has led him to treat of many themes, but he also attained his supreme distinction in drawing a Southern character, that of *Colonel Carter of Cartersville*, the hero of his first novel, which appeared in 1891. This gentleman of optimistic nature, with a child-like trusting character, courtly manner and belief in the goodness of everyone, has become one of our permanent possessions. No other of Mr. Smith's Southern characters, charming as the heroes of *Peter* or *Oliver Horn* may be, have the distinction of Colonel Carter. Mr. Smith has not confined himself, however, to the treatment of Southern types. His experience as an engineer has resulted in *Tom Grogan*, an original conception, and in *Caleb West;* and his minute study of the lives of the coast guards has given us *The Tides of Barnegat*, in some ways the best constructed of his novels.

Mr. Allen began writing in the early eighties, but it was not until the publication of *Flute and Violin* in 1891 that he became known. Mr. Allen's progress has been planned very definitely, but seems not to have been widely understood. In his early stories, such as *The Kentucky Cardinal* or *Aftermath*, he selected

familiar material which he treated by an idealistic method. In *A Summer in Arcady*, *The Reign of Law* and *The Mettle of the Pasture*, he passed into a realistic phase, while in *The Bride of the Mistletoe* and *The Doctor's Christmas Eve*, he returned to idealism in his production of types of character and remained realistic in his description of details. The theme of these later books, the longing of middle age for youth, has seemed to many to have a touch of the morbid about it, though Mr. Allen has strenuously denied any such intention. The charm of his books, and the charm is great, is due largely to his descriptive power, but the significance of his work is also due to his ability to interpret the native ideals of cultivated American life in Kentucky. The passages in *The Bride of the Mistletoe* which describe the descent of family traits through generations of American stock deserve to be read by every American.

Belonging to a younger generation than this group of Southern writers and turning from the idealistic treatment of character to a realistic study of moral and social conditions, Margaret Deland and Edith Wharton rise above the other novelists of their kind. Mrs. Deland published first, and in *John Ward, Preacher*, in 1888 she struck at once upon the theme she has developed since in her novels and short stories, the moral growth or decay of a human soul. Coming so soon after *Robert Elsmere*, it was affected by religious questions from which Mrs. Deland has fortunately freed herself more definitely than Mrs. Humphry Ward. It is as though the mantle of George Eliot had been divided, and surely the American novelist wears her half with as great distinction as her English rival. It is rather as a student of moral and ethical problems than as a pleader for any religious platform that Mrs. Deland has done her best work. As a great objective artist, whose own personal preference it is hard to find, she treats marriage and divorce or other social problems with keen insight, broad sympathy and wide knowledge. Her characters are real and varied and in Dr. Lavendar, she has painted a clergyman worthy to be admitted into the company of Amos

Barton or the Abbé Constantin. He is the concrete exposition of her lack of patience with fine-drawn theories about right and wrong. As she makes Alan say in *Sidney:*

"I tell you, Bob, there is a point where concern about right and wrong becomes the subtlest kind of egotism."

Mrs. Deland is serious in her art, but she is not a preacher, she lets her characters tell dramatically the story of tragedy or comedy that teaches indirectly the great lesson that the highest reward that can come to anyone is the securing of his own self-respect.

Just as Mrs. Deland stands for moral development, so Mrs. Wharton stands for social satire. Even if her first long novel, *The Valley of Decision*, was historical, it was a treatment of the social conditions in Italy of the eighteenth century that was interesting, and already in her short stories she had established herself as the keenest social satirist of her day. In 1905 she struck a great note in *The House of Mirth.* In it she created the character of Lily Bart, the handsome well-groomed, modern girl of society, keen to seize advantages, calmly preparing to marry a wealthy man she despised, and then refusing to take the final steps,—impelled toward Lawrence Selden by everything that is fine in her nature, and yet hesitating till too late to face comparative poverty with him. Through her supreme naturalness, her determination to have moments of emotional relaxation from an intellectually selfish program, she rises to the highest ranks in that fictional society where Becky Sharp reigns supreme. The basic heartlessness, the utter selfishness of certain sections of our society, its lack of personal distinction or intellectual resource is depicted with a master hand. In her other novels Mrs. Wharton has touched upon differing themes—the comparison of French and American civilization in *The Reef* and in *The Custom of the Country*—the portrait of an utterly selfish woman in the latter book—and, best of all, the wonderful tragic outline of New England village life in *Ethan Frome.*

In her style, Mrs. Wharton is the most distinguished of our

modern writers. The brilliancy of her epigrams, the nice choice of words, the cadence of her sentences belong to the assured master of language. But perhaps even more than her style, or perhaps because of it, the quality of Mrs. Wharton that impresses us is her reality. There is no sudden glory, no radiance in which we leave her characters. They glide into our knowledge, play their parts, and glide out again. We are not lifted out of life by them, nor are we plunged back into life, desponding, after they depart. For they are not made of dreams, or of the glitter of romance—they are born of the very essence of reality.

We have seen, then, how the American novel began in a tentative imitation of an English mode, how there soon developed a romance of American life, which in the hands of Hawthorne became spiritualized and idealized; how after the Civil War, Mr. Howells and Mr. James led the return to the realistic treatment of familiar life, which has affected our literature ever since, although by 1880 the work of Mr. Crawford, Mr. Page and Mr. Cable showed the ever-recurring demand for romance which was emphasized by the historical romances of Dr. Mitchell and by the popularity of the idealistic romance of which Mr. Hopkinson Smith is the representative. That the classic realistic mode is still a great force, however, is shown by the unquestioned distinction of the work of Mrs. Deland and Mrs. Wharton.

So far I think there can be no question of the significance of the novelists I have mentioned. Either absolutely or historically, they demand treatment. We come now to the debatable ground of contemporary judgment. In the generation to which Mrs. Deland and Mrs. Wharton belong, one might have placed Miss Murfree, Mrs. Freeman, Miss Jewett or Mr. Wister, without much criticism. But already that generation is passing and the inquiry is—what of the future?

At first glance that future seems not very promising. When we remember that every novelist I have treated except Mrs. Wharton was born before the Civil War, the necessity of

facing the question of their successors becomes insistent. When we survey the output of novels in the last three years we see that it is large, that it is prevailingly realistic in treatment and that it is concerned with a serious treatment of modern moral, economic, social and political conditions. The idealistic romance seems for the time to have passed. We note also the large number of writers who are good craftsmen, who entertain, but who just fail to be significant. There are some who will bear watching, however. There is encouragement in the joyous invention of the author of *Queed*, or in the delicate insight that created *Alexander's Bridge*, or the searching analysis that resulted in *Jennie Gerhardt*.

But more encouraging still is the continuous achievement which has been the subject of our inquiry this afternoon. Who that has lived in joy or sorrow with Harvey Birch and Leatherstocking, with Hester Prynne and Donatello, with Mulberry Sellers, with Elsie Venner, with Silas Lapham or Isabel Archer, with Emmanuel Bayard, or Hugh Wynne, with Marzio or Saracinesca, with Bonaventure or Honoré Grandissime, with Mars' Chan, or Colonel Carter, with Adam Moss or Dr. Lavendar, with Sarah Maitland or Ethan Frome, can believe that the portrait gallery of the American novel is to come to an end? Or who that has felt the salt spray on his cheek while the Pilot carried the Ariel through the British shoals; who that has watched the agony of Arthur Dimmesdale as he stood on the Boston scaffold with Hester and Pearl beside him; who that has seen Squire Gaylord make his last plea in defense of his daughter's name; who that has heard with a growing fascination of horror the voice of Peter Quint calling across the unknown to the little boy whom he would destroy; who that has seen Sip Garth hold up her dumb sister's fingers to God that He might answer the question she could not bear to see; who that has stood with François and the Marquis at the head of the staircase up which the Jacobin mob was soon to rush; who that has lived with Madame Delphine through the hour of agony when she denied her child in order that that child

might marry a man of the race that despised her; who that has watched beside the death-bed of the Old Gentleman in the Black Stock; who that has seen the look of horror come over David Richie's face as his mother bared her life secret and pointing to him, cried out to Elizabeth Maitland: "Elizabeth, did you see how he looked at me? Some day your son will look that way at you!"; who that has been in Lawrence Selden's room when Lily Bart puts her future in the fire rather than bring into an hour's scandal the name of the man she loves; who can believe that the masters of narration and description that made the past live and the present glow with action are to have no successor? For my part I am confident that just as every great epoch in our national life has evolved a leader to direct its progress, so the multiform, interesting life of today will develop minds and hearts capable of interpreting and revealing it and that the American nation will never be long without its novelist.

THE VETERINARY PROFESSION AS A CAREER

By John W. Adams

Professor of Veterinary Surgery and Obstetrics
University of Pennsylvania

We are constantly told that every vocation which offers a career and a competence is crowded, especially all the professions. In the medical profession, for example, we believe there is an average of one physician for every 640 people. Of this number probably one-half need no medical attention; of the remaining 320, a part go to the dispensaries, and the remaining very modest number have to apply themselves quite vigorously to being sick in order to afford a frugal maintenance to the physician who is allotted to them. Some time ago an eminent physician, professor in a medical school, was asked if the profession was not becoming crowded. He replied, "Oh, no; it is not becoming crowded—it has long since passed that point. It *is* crowded."

But there is one branch of medicine which is not crowded. In the twenty-one schools of veterinary medicine in the United States there was during the school year of 1912–13 a total attendance of 2,400. There are in the United States 117 medical schools, with an attendance of approximately 16,364. In the Veterinary School of the University of Pennsylvania there are 118 in attendance. In the six medical schools in Philadelphia there were during the last year 1,555 students.

There were, in 1910, in the United States, 71,059,573 cattle, including 23,000,000 dairy cows, 24,048,000 horses, 4,310,000 mules, 57,555,000 sheep and 49,674,000 swine, worth approximately $6,700,000,000, and all of these animals might at times require the services of a veterinarian. As has been humorously expressed by a recent writer, "Animals probably live more nearly according to nature than human beings, and are thereby less liable to sickness. Probably also they are freer from nerves

and have less temptation to aggravate their sufferings by talking about them. We have no reason to suppose that there are among them any millionaires, or wives of millionaires, who find their diversion in being ill and in consulting a physician, although there is probably something analogous to this class of cases among the many million dogs, cats and other household pets whose health is shattered by overfeeding and indolence."

But, while the scientific care and treatment of the individual animal in health and sickness is important, and probably will continue to be the most remunerative part of veterinary medicine, there are other vastly larger interests involved. Our relations to the domestic animals are very close. Investigation has revealed many intimate relations between the diseases of the human race and those of our domestic animals; many dangerous and deadly diseases are likely to be transmitted from animals to men, either by contact or through the consumption of meat, milk or meat-food products.

From time immemorial devastating epizootics have periodically swept through the world's flocks and herds and destroyed vast numbers. It is safe to say that were our present sanitary police regulations held in complete abeyance for a very few years our entire livestock industry would be wiped out. Glanders, dourine, pleuro-pneumonia, tuberculosis, hog cholera and swine plague, rabies, Texas fever, anthrax, symptomatic anthrax and aphthous fever are but a few of the dangerous and deadly diseases that are an ever-present menace to our livestock as well as to man himself.

The livestock industry constitutes the foundation of agriculture and of national wealth, and the prosperity of the country depends principally upon its rural population. No more convincing argument than this is needed to show the importance of preventing the ravages of diseases which, if uncontrolled, would devastate the livestock industry and ruin agriculture.

History: The history of veterinary medicine is coeval with human medicine. The earliest writings are to be found in the literatures of India and Egypt, but from Grecian writers and

particularly from Hippocrates, Aristotle and Galen do we get the earliest reliable knowledge of comparative anatomy and quite accurate descriptions of diseases. Hippocrates discovered hydatids in the lungs of animals and described dislocations, dropsy, epilepsy and parasitic cysts in the brain of sheep. Aristotle wrote on comparative anatomy and physiology, and described several animal diseases, among them tetanus and glanders.

The Romans knew little of veterinary medicine till after the conquest of Greece. Varro (116–28 B. C.), in his "De Re Rustica" (3 vols.), largely derived from Grecian sources, was the first Roman to write of veterinary medicine in a scientific spirit. Vegetius Renatus directed attention to the close similarity of certain diseases of man and animals, and suggested the possibility of intertransmission. From the third century A. D. veterinary medicine had a literature of its own and practitioners in the service of the Roman armies, who were termed "mulomedici" or "veterinarii."

The most renowned veterinarian of the Roman Empire was Apsyrtus, of Bithynia. He was a keen observer: he recognized the contagious nature of glanders and anthrax and prescribed isolation for their suppression; made interesting observations on injuries and defects of horses' limbs and attacked absurd empirical practices in the treatment of disease, indicating rational methods, some of which are followed even today.

Other writers described surgical operations, recognized the advantage of disinfectants, but were more or less superstitious and believers in demons and sorcerers.

Of other ancient writers on veterinary subjects we know little beyond what can be gathered from the citations and extracts in the two great collections of "Hippiatrica" and "Geoponica," compiled by order of Constantine in the tenth century.

During the Middle Ages the practice of the veterinary art is enveloped in darkness, but toward the close of the medieval period the subject was fostered in the cavalry schools of Italy and Spain, and the end of the sixteenth century saw a marked

awakening of interest in comparative medicine. In Italy, France, Germany and England numerous meritorious works appeared. Comparative anatomy, long neglected, was prosecuted assiduously and several anatomies appeared, the most noteworthy of which was that by Carlo Ruini, senator of Bologna, published in 1598, under the title, "Dell' Anatomia e dell' Infirmita del Cavallo, e soui Remedii." It retained its popularity for 150 years and was translated into French and German.

In England during the seventeenth and eighteenth centuries were such prolific writers and able practitioners as Gibson, Bracken, Burdon, Snape and Stubbs. In France, Solleysel's "Parfait Marèschal" (published in 1664), passed through many editions and was translated into several languages.

The modern era, the most important in the development of veterinary science, may be said to have begun with the founding of the first veterinary school at Lyons, France, in 1761, by Claude Bourgelat, an advocate and a talented hippologist. The French government immediately assumed the support and administration of this school, and so great were the evident benefits to the country that the government opened a second veterinary school at Alfort in the suburbs of Paris in 1766, and yet a third at Toulouse in 1825. These three schools are flourishing today, have graduated thousands of well-educated veterinarians and have had on their faculties such brilliant men as Vic d'Azyr, the anatomist; Fourcroy, the chemist; Gilbert, Bouley, Chauveau, Colin, Toussaint, St. Cyr, Goubaux, Arloing, Galtier, Nocard, Trasbot, Neumann, Cadiot and Leclainche.

Following the lead of Alfort, government schools sprang up in many European countries: in Turin, 1769; Copenhagen, 1773; Vienna, 1775; Dresden, 1776; Hanover, 1778; Berlin, 1790; Munich, 1790; Budapest, 1787; Madrid, 1793.

Today France has three national schools; Germany, 6; Russia, 4; Italy, 6; Spain, 3; Austria-Hungary, 3; Switzerland, 2; Sweden, 2, and Denmark, Belgium, Holland and

Portugal, each 1. The veterinary schools of Berlin, Hanover and Vienna have been raised to the rank of universities.

In England, St. Bel, in 1790, founded the veterinary college of London. This has been followed by the Edinburgh school, founded in 1819, by Prof. Dick, a man of pre-eminent ability; by the "New Veterinary College" of Edinburgh, founded in 1873, by William Williams, and since 1904 associated with the University of Liverpool. The Dublin Veterinary School was thrown open to students in 1901.

In America, the practice of veterinary medicine, in the modern meaning of the words, is comparatively recent. While from very early times men of varying qualifications practiced veterinary medicine and surgery throughout our country, yet few were graduated, as schools had not yet been established in America, and rarely, if ever, did it occur that an American went abroad to acquire veterinary training. Great credit is due the few who without the advantages of instruction other than that which could be obtained from medical reading and personal observation and experiment, became of great value to their respective communities.

The first veterinary school in America was a private institution established in New York City in 1846. More private schools followed: one in Boston in 1848; the "American Vet. Coll.," New York City, in 1857; the Chicago Vet. College, in 1883, and at varying intervals other private veterinary schools in New York, Chicago, Cincinnati, Washington, D. C., Baltimore, Toronto, Kansas City, Indianapolis, Terre Haute, St. Joseph, Mo., San Francisco and elsewhere. Until very recent years the course of study furnished by these schools dealt almost exclusively with the horse, was most elementary and notoriously incomplete. The entrance requirements were practically nil. There was almost no equipment and the length of course was uniformly two years of five and one-half months each.

Though the policy of private schools was dominated chiefly by the spirit of commercialism, yet it must be admitted that

they performed a real service and provided a type of veterinarian considerably more efficient than the empiric, who up till that time had the whole field to himself. The material success of the proprietary schools and the accumulating hazards of a rapidly increasing livestock finally led to the establishing of a few veterinary schools as departments of colleges or universities. Thus, beginning in 1883, veterinary schools were established at Harvard, University of Pennsylvania, Cornell, Ohio State University, Iowa State University, and under control of the respective States at Pullman, Wash.; Manhattan, Kan.; Fort Collins, Col., and Auburn, Ala.

One cannot contemplate the development of these veterinary institutions without a feeling of admiration for their achievements and a conviction that the phase of education which they typify is destined to become more and more important in America. The essential basis and foundation of a nation's welfare is to be found in its educational conditions. It is true that those abstract qualities which contribute to national greatness and patriotic citizenship are the offspring of ideals, rather than of material things, but these can never come to their fullest fruitage without that substantial foundation afforded by rational and well-balanced educational forces. Humboldt, the German philosopher, has truly declared that "whatever you put into the state, you must first put into the schools," and it is equally true, that the standing of the veterinary profession is dependent on the strength of its schools.

The first public veterinary positions that were established in this country were under the National Treasury Department, which organized a Cattle Commission in the early 70's for the purpose of controlling the several outbreaks of contagious pleuro-pneumonia that had resulted from the importation of diseased cattle. After a few years' experience it was found that this organization could not meet the needs of the situation, so in 1884 the "Bureau of Animal Industry" was established in connection with the Department of Agriculture at Washington. Under the able direction, first of Dr. D. E. Salmon and later

of Dr. A. D. Melvin, the field of usefulness of the Bureau of Animal Industry has constantly enlarged. From a mere handful of veterinarians engaged in the suppression of a single disease of cattle, it has grown until we now find it comprising ten large divisions, with its agents stationed in all portions of the United States, and engaged in investigations of outbreaks of contagious and infectious animal diseases, and in the employment of measures for their suppression or eradication; "in the inspection of animals, meat, and meat-food products in connection with interstate and export business; the inspection of animals for export; the inspection and quarantine of imported animals; studies in the feeding and breeding of livestock and poultry, and the diffusion of knowledge on these subjects." The officials employed in all of these branches of work, most of which is purely veterinary, numbered, on July 1, 1911, 3,284. The operations of the Bureau have proven to be of such vast importance and value to the country as to justify an expenditure of somewhat more than $3,000,000 annually. This expenditure has undoubtedly saved, millions upon millions to the nation, and has made it possible to develop the most profitable branch of agriculture. No other expenditure of the government yields a more direct and valuable return.

If the scientific staff of the Bureau of Animal Industry had never done anything more than to make the classic discovery of the mode of transmission of Texas fever by the cattle tick, the Bureau's existence would have been amply worth while. This discovery established a new principle in medical science, the extent of the application of which the world is only beginning to realize as we learn to conquer in turn such maladies as yellow fever, malaria and sleeping sickness. It has made possible such triumphs of sanitary science as have been accomplished on the Isthmus of Panama, and without which the great canal could not have been constructed so expeditiously and with so little loss of life.

In the prevention and eradication of animal diseases the Bureau has been of the greatest economic service. On several

occasions it has saved the livestock industry of the country from disaster and ruin. The immediate cause of its inception was the presence of contagious pleuro-pneumonia of cattle which had slipped in from abroad and becoming established in the Eastern States had spread westward as far as Illinois. It was after several years of effort that this insidious and stubborn disease was completely stamped out, and it has not since appeared.

Twice the Bureau has had to deal with outbreaks of foot-and-mouth disease (*aphthous stomatitis*), first, in New England, and later in some of the Eastern and Middle Western States. Each time the disease was conquered by prompt and vigorous work by a well-organized force of trained veterinarians and assistants. In studying the origin of the latest outbreak it was found that the infection was due to contaminated imported vaccine virus, and an interesting case of symbiosis of vaccinia and foot-and-mouth disease was discovered and demonstrated.

For many years the presence of cattle ticks and the infection of Texas fever have made it necessary to maintain a quarantine on cattle in a large area in the southern part of the United States. The movement of these cattle to northern markets has been permitted only under restrictions which entailed expense and lowered prices. The disease was a great disadvantage to the infected region and prevented the development of cattle raising there. The losses and damage have been variously estimated at from $40,000,000 to $200,000,000 a year. Applying the knowledge gained as to the nature of the disease, the life history and habits of the ticks and the methods for their destruction, the Bureau, with local help, has, during the past seven years, waged a highly successful warfare of extermination against ticks. The territory freed of infection in this time now amounts to nearly 200,000 square miles, and almost equals in extent the combined areas of Pennsylvania, Georgia, Alabama and Mississippi. More than one-fourth of the territory originally infected has now been cleared, and we may look forward

to the time when a great section of our country, naturally suited to cattle raising, will do its part toward supplying beef to feed our growing population.

The United States Meat Inspection Service constitutes the largest piece of veterinary administrative work in the world. Inspection is maintained in 786 establishments in 222 cities and towns, requiring the services of about 2,500 employees, including a large proportion of veterinarians, who make all final decisions on post-mortem. During the year 1911 (the latest available record), bureau inspectors made 53,000,000 ante-mortem inspections; 52,976,000 post-mortem inspections; condemned 39,402 whole carcasses of cattle; condemned 7.600 calves, 59,400 swine, 10,700 sheep and 61 goats. The parts of carcasses condemned reached the enormous total of 1,014,000. The causes of condemnation were tuberculosis (chiefly of cattle and swine), actinomycosis, hog cholera, septicemia, tumors and abscesses, inflammation of internal organs, injuries and bruises, emaciation, Texas fever, etc.

The Bureau also undertakes the breeding of horses for army use, sheep and cattle breeding experiments, poultry investigation, beef and pork production experiments; dairy, milk, cheese, cream and butter investigations; the eradication of scabies in sheep, cattle and horses; the inspection of livestock for interstate movement; the inspection of vessels and export animals; inspection and quarantine of imported animals, and does research work on a host of diseases.

The Bureau prepares tuberculin for testing cattle for tuberculosis, mallein for testing horses and mules for glanders, hog cholera serum for treating and immunizing swine against cholera, and supplies these agents gratis to public health officers; experiments with immunizing agents, prepares vaccines, sera and antitoxins for the protection of animals against disease. It prepares and publishes many books, pamphlets and reports on subjects relating to livestock. In these and in many other ways the Bureau has given the world valuable scientific knowledge, has benefited humanity, protected health, performed

economic service to stock raising interests, and reflected credit on the veterinary profession.

But it is not possible for the Bureau of Animal Industry, a national organization, to infringe upon the functions of state government and the states have found that it is to their benefit and interest to establish veterinary organizations through which their local functions can be exercised and contagious diseases of animals investigated and measures taken for their suppression.

State functions, in so far as they relate to the protection of the livestock industry, are exercised through veterinarians working with veterinary boards, cattle commissions, livestock sanitary boards or commissions, boards of departments of agriculture, boards of health, etc. Nearly every state has a regularly appointed state veterinarian, who is in many cases aided by a corps of assistants. In some states the livestock interests of each locality are supervised by an assistant or deputy state veterinarian.

The diseases that come within the domain of state veterinarians are numerous and important and affect all classes of animals, including poultry, and cause losses aggregating millions of dollars every year. During the last year the single disease, hog cholera, destroyed 6,500,000 swine and there are other maladies fully as destructive. Some of them are well understood and the measures to be taken for their suppression are plain and simple. Others are not well understood, and in these cases it is necessary for the state officer to possess much skill and judgment. Occasionally diseases are met with that are new, or of an irregular type, and some of the more common diseases are but poorly understood in respect to their etiology, method of transmission, etc. In these cases research is necessary, and the state veterinarian should be provided with a research laboratory, and should have a sufficient knowledge of the methods employed in original work and know enough pathology, bacteriology and chemistry to enable him to solve many of these difficult and important problems.

The subjects of meat and dairy inspection are now promi-

nently before the public and their extreme importance both to the producer and to the consumer is fully recognized. The owners of abattoirs under Federal inspection appreciate its importance to such an extent that they encourage it in every way. The local butchers are also beginning to realize that a similar inspection would be of advantage to them, and as boards of health and sanitary authorities grow to realize the advantages of a thorough system of meat inspection from their standpoint, the practice of examining all animals intended for human consumption will increase and a general far-reaching system will be established. In the same way, the inspection of milch cows and dairies will be demanded by the consumer for his protection, and by the producer for the market advantage that it will give. This development will make large drafts upon the veterinary profession and the rapidity with which these new systems will grow will be in direct proportion to the ability of veterinarians to respond adequately to the demands for their services.

But it is not necessary to wait for the future to provide useful and desirable positions for veterinarians in state veterinary service. The greatest difficulty that confronts those who are responsible for the enforcement of public measures for the suppression of diseases of animals lies in the difficulty of obtaining the assistance of a sufficient number of well-trained veterinarians, men who have had the advantages of a thorough course of instruction, and whose powers of observation have been cultivated in well-attended clinics and whose minds are disciplined by carefully conducted laboratory work in such branches as anatomy, physiology, chemistry, pathology and bacteriology. For men of this kind there is great need. The importance of veterinary work is more fully realized each year, but the demand for veterinarians is discriminative and as the lower ranks of the profession fill, there is more room at the top.

THE GERMAN BARN IN AMERICA

By M. D. Learned

Professor of Germanic Languages and Literatures, University of Pennsylvania

The marked German influence manifested in America during the nineteenth century in quickening our national literature, rationalizing our philosophy and religion, reorganizing our educational institutions and transforming the American college into an American university of German type, and stimulating research in all fields of science, thus powerfully affecting our industrial and social life, is so striking as to make us lose sight of the important contributions of the early German colonists to American civilization. But a closer study of the character and institutions of the Colonial Germans in America will show that they brought with them many of the most valuable factors in our Colonial life. They brought the skilled artisan—the carpenter, the wheelwright, the blacksmith, the joiner, the shoemaker, the baker, the tanner, the miller, the cooper and the weaver. They brought also the printer and the printing press, the parson and the schoolmaster. Most significant of all, they brought a new mode of farming and a new type of farmer, who was himself a disciple of the old Roman art of farming introduced into the *agri decumates*. But of all the industrial institutions, which these Germans brought with them, two stand out pre-eminently as transforming factors in our economic growth. These two factors were the *German barn* and the *German wagon*, the pillars of our agricultural economy and our inland trade.

In order to determine more accurately the influence of the German factors in our Colonial life, the German Department of the University of Pennsylvania, aided by liberal citizens of Philadelphia, organized in the summer of 1902 an Ethnographical Survey, the first of its kind in America, for the purpose of

collecting accurate statistics concerning the early Swiss and Palatine settlements in Pennsylvania. Some of the results of this first expedition were published in a volume entitled: *The American Ethnographical Survey. Conestoga Expedition*, 1902. (*Americana Germanica*, No. 12, 1911.)

Among the unpublished studies thus begun is the *History and Development of the German Barn in America*, which is here presented in brief outline, but is soon to appear in book form, with ample illustrations of the various types of the peasant house and barn in Germany, Switzerland and America.

German travelers, such as Dr. Schoepf and others, and German diarists like Wiederhold, Waldeck and others, who described their experiences in the Revolution, directed particular attention to the conspicuous German barns and the German method of housing the stock and the products of the soil, as in striking contrast with the shiftlessness of most of the English colonists, who built sheds instead of barns, stacked their hay and grain outside, and often provided nothing but the straw-stack for the shelter of their cattle. The traveler of today, likewise, in passing through Lancaster and other German counties of Pennsylvania, is impressed with the mammoth German barns of these regions, which house horses, cattle, sheep, swine, and at the same time the hay, the grain, and sometimes even the straw, as well as the wagons, carriages and agricultural implements all under one roof.

The American tourist passes by the thatched-roof peasant hamlets of Holland and Low Germany, the tile-roofed villages of the Middle Rhine, and the upland houses of the Schwarzwald, German Switzerland and the Tyrol, admiring their quaintness, but little dreaming that these lowly homes of the continental peasant have a striking survival in the barns of Dutch New York and New Jersey, and particularly in the Swiss barns of Pennsylvania, which he passed on his way to the seaboard.

The migration and survival of architectural forms is a valuable guide to ethnography as well as an esthetic factor in the rural landscape. It is the peasant house, with the barn under the

same roof, which lends a unique beauty to the rural scenery of Holland, Germany, and the valleys of Switzerland, and it is the survival of the Swiss barn which gives peculiar charm to the rich valleys of Central Pennsylvania, as well as to other parts of America settled by Swiss and Palatine farmers. The quaintness of the peasant village in the older communities of Germany—the peasant house with its complex of stable and barn, the communal hall and schoolhouse, and the church with its spire crowning the whole with artistic symmetry—has not repeated itself to any great degree in democratic America. The eye of the traveler in Europe is constantly captivated by the endless variety and simple beauty of these community settlements. Notwithstanding the great uniformity of type in the general plan of these peasant houses, the variations of the individual structures of the village groups display the inexhaustible resources of the peasant for harmonizing his habitation with the natural setting of hill and holt and stream and dale.

An air of originality and of antiquity characterizes the peasant house of the older countries and expresses the semi-conscious instinct of the peasant for conserving and adapting to new conditions the achitectural forms handed down through long generations. This traditional conservatism and its attendant persistence of type and structure make the study of rural architecture a fruitful means for determining the ethnography of German and Swiss settlers in America. In like manner the study of the Swiss barn reveals one of the most useful and interesting forms of evolution in our rural achitecture.

The Primitive Germanic House

Information concerning the primitive Germanic house is scant. Tacitus tells us the Germans lived scattered among the streams, fields, groves: "Colunt discreti ac diversi, ut fons, ut campus ut nemus placuit" (*Germania* 16). The earliest detailed description of the parts of the Germanic house are found in the Gothic translation of the Bible made by Bishop Wulfila for the

Goths about the middle of the fourth century A. D. The dozen or more terms for parts of the house here found show that the Gothic house was quite similar to that described as general Germanic by later documents and still surviving in the German peasant house of the present day:

bauains = dwelling. Cf. the very *bauan* = to dwell.
gatimreins = timbered structure, showing that the Goths had the *frame house*.
salithwōs = plural form. Cf. O. H. G. *selida* = dwelling. The original meaning seems to have been that of *hall* or house, of one room, as is indicated by Anglo-Saxon *selt*.
razn = house, abode or place of rest.
hûs = house, found in compound *gud-hûs* = temple. In Crimean Gothic = one-room house.
rôhsns = vestibule, anteroom.
gibla = gable. Corresponding to the Greek word for *head*.
hrôt = roof or loft. Cf. English *roost*.
auga-dauro = window, lit. *eye-door*.
banst = barn.
waddjus = wall. Cf. German *Wand*.
gards = yard, enclosure.

In its primitive form the barn is a part of the house. The most primitive form of the Germanic house seems to have been the *booth* constructed of the limbs and foliage of trees. Then came the *hut* formed by arranging cut saplings or trees in such a manner as to enclose a space for shelter by bringing the tops of the trees together at the top of the hut, leaving an aperture for the issue of smoke. The third stage in the evolution seems to have been the *tent* with portable parts. All these forms of the house belong to the nomadic epoch of the race, the last stage, the portable house, giving rise to the idea of the house as *movable property*, long so recognized in German law. There is also good evidence in the northern survivals of today that the house was often a cave in the hillside and constructed, in part at least, of stone.

Two modes of building are found in the earliest forms as well as in the present survivals of the house:

1. The *upright frame structure* (German *Ständerbau*), and
2. The *log* or *block structure* (German *Blockbau*).

The priority of these forms is still an open question. Heyne considers the frame structure as the direct outgrowth of the booth form and therefore the more original. It is a notable fact that the frame structure has proved the most tenacious in Germany, Switzerland and America to the present time.

The Peasant House of Today

The Germanic house, as it survives in the peasant house of the present time, exhibits a great variety of forms which may be reduced to two ground types:

1. The Lowland German House, which has four important varieties: the Saxon house, the Frisian house, the Scandinavian house, and the so-called Anglo-Danish house.

2. The Highland German House, including the Frankish house and certain forms of the Alemannic Bavarian house, and the High Alemannic or Swiss house of German origin.

In the historical treatment of these different types of the peasant house not a little confusion has arisen. Some writers have advanced the theory that the house is a later development of the more original barn, a theory which easily confutes itself on closer examination. Other writers, like Henning, assume originality for the several ground types of the Saxon, Frisian and other forms of houses, many of which are in reality but variations of one original type.

It is sufficient for our purpose to consider two fundamental types or ground plans of the house as indisputably original, viz: the Lowland house, the Highland house. It is these two types particularly that have survived with many variations in the American barn.

The simplest and evidently most original surviving form of the Low German peasant house is the Low Saxon house. This

consists of a long rectangular structure of two varieties, one, and probably the more original variety, with the door in the gable end, and the entrance passing through the house to the barn door at the other end. The other variety has the door at the side of the house, where barn and house meet under the same roof, or a door both at the gable and the side. In this Saxon type of house there is usually but one story. One end of the house serves as a dwelling for the family, the other end for the stock. The rooms for both man and beast are arranged along the sides of the long structure, while a wide passageway extends through the house from end to end, that is, from the house door to the barn door. It is this type of house that attracts the traveler's eye over a large extent of Low German territory, and is typical in many parts of Holland. It has, doubtless, a common origin with the so-called northern long house described in Norse Sagas and referred to by Beda in his touching description of the span of life as likened unto the flight of the bird through the long hall in a stormy night.

The Highland German house has no doubt been influenced by the hilly character of the country, and has a fuller development into stories. The typical so-called Frankish Upper German house has the stable in the basement, the dwelling for the family in the first story above the basement and the large loft under the sloping roof, which is again sometimes subdivided into stories, but in its more primitive form extends clear to the top of the roof. In this type of house the door or entrance to the house proper is reached by steps leading up from the ground. It is very usual to find the outside door leading to the dwelling, or house proper, on one side of the structure, and to the stable on the other side.

The Swiss type of the Upper High German house exhibits two forms: one, a house usually modified from the so-called Frankish-Upper German type described above, having the entrance on a level with the ground or reached by steps with the basement below, and, second, a more pronounced type of the side-hill house, with the barn in the loft, and an elevated drive-

way for wagons direct into this loft barn. This is the original of the Swiss barn or bank barn in America.

There is still another type of house, particularly frequent in the middle Rhine country, which Henning discusses under the heading of the *Bauernhof*. The locality in which this type occurs suggests its possible origin. I do not believe, as Henning does, that this is a primitive Germanic type of house, but I see in it rather the influence of the ground plan of the Roman house. The plan of this Midland German house with a court is usually that of a quadrangle enclosed at least on three sides, and often on four sides, with the entrance from the street into the court. The house proper, or dwelling for the family, is on one side of the entrance and is continued around the quadrangle in the form of stables for the cattle and horses, the barn, which is usually opposite the street entrance to the court, and the sheep stall and the poultry houses extending around the third side, thus leaving the rest of the quadrangle an open court. The prominent features in this open court are the dung heap or dung pool in the middle, and not too far away from it the pump which furnishes water for the family, the stock and the dung pool.

While it is quite possible that this type might have developed sporadically on German soil, it must be admitted that the prevailing type of the German house, both in the lowlands and the highlands, is that without the court. Both the Low German and the High German house described above stand out free, without any court enclosure, and where the house itself is not sufficient to shelter the stock and produce together with the family, the house structure is repeated in another building to serve as barn or stable or both. The fact that the midland quadrangular house with the court is found in the region under the influence of the *agri decumates*, would explain the possible Roman origin of this type.

The house thus far discussed as typically Low German or High German has included house and barn under one roof. In Switzerland, as in Low Germany, when there was need of

more stable or barn room, another building of the general type of the house was erected, but usually without the plan of a court.

The German Barn in America

In tracing the history of the barn in America, the racial origin of the settlers and the traditions which they brought with them must be considered. It is no longer safe for the historian to assert that the early traditions of the American colonists in their old homes had nothing to do with their life in the new country. We know, on the other hand, that these European traditions were perpetuated in a modified form in American life and institutions. It would be folly to attempt to discuss the colonial residence or manor house without reference to the prevailing style of English architecture. In like manner we must seek the prototype of the American barn in its European predecessor.

In general, three types of American barn are easily distinguishable: the English type, exemplified in the simple shed barn of Virginia, and in a more elaborate New England form, in the likewise quite simple structure of the barn as separate from the house but sometimes connected with the house by a passageway, wood-shed and the like. These two varieties of the English barn are comparatively negligible quantities in the development of the country, and were usually insignificant as compared with the house. Nevertheless, they are important guides in tracing the footsteps of the English settler in the new country, and have survived as characteristic types in New England, parts of New Jersey, lower Delaware, the Eastern Shore, and the tidewater regions of old Virginia down to our own time.

A far more important type of American barn is that brought over by the Dutch settlers in New York, the Low German type, which had its origin in the long Low German house, the best form of which we have seen in the Saxon house. This Low German, or, as we should more naturally call it, Dutch barn, is that so frequently found in eastern New York along the

Hudson and the Mohawk, and in northern New Jersey. This New Netherland or Dutch barn has in many cases undergone another evolution in the form of a second structure built across the end of the main structure and extending in the form of an L. This barn is a very spacious structure, furnishing ample room for the stock, the grain and the hay. It is a flatland barn, without the bank feature in the typical Swiss bank barn. It was this barn which called forth comment from travelers in these regions in the eighteenth century, just as the Swiss barn attracted attention in Pennsylvania.

The presence of this Holland barn in these localities is explained by the fact that the Dutch were the early settlers in this region, and the territory over which these barns are distributed is strikingly co-extensive with the old Dutch settlements, although in some directions the type of barn has extended beyond the actual Dutch limits.

An adjunct to this Dutch barn, the sliding hay roof, is an almost infallible touchstone in tracing the Dutch architecture in these localities. This adjunct, the movable hay roof or shed, consisting, usually, of a four-cornered roof of straw or other material, which can be moved up and down on four poles or posts, to protect the hay or grain from the weather. This hay roof or shed is frequent in Holland, and had its origin, doubtless, in the overflow of the barn, when house and barn were under one roof. It is, at any rate, a vast improvement upon the English method of stacking hay and grain out in the open weather, and has thus tenaciously persisted in the old Dutch localities proper, and even been extended to other districts.

The most striking and influential type of barn in America is the Swiss barn. This has persisted in two forms—in the flat barn built directly on the ground, with the entrance on the side, as in the case of the Swiss flat house. It is easily recognizable, even in its most primitive survivals, from the peculiar notching of the roof, after the manner of the Swiss house. A few specimens of these early barns are still found in Lancaster and adjacent counties. Some of them are log structures, and

very primitive in form. One specimen was found, which was a low, one-story structure, a hundred and fifty feet long by thirty wide. Under this roof were at one end the wagon-house and adjoining it the horse stable, the cow stable, the calf stable, the sheep stable, and at the extreme other end the threshing floor and hay mow. It is interesting to note that the dwelling house which stood near this barn was scarcely as long as this barn was wide.

The dominant type, however, of the Swiss barn is the so-called *bank barn*. This has as its ground plan that of the Swiss bridge barn, or the Swiss house with the barn in the loft and the inclined driveway into the barn. The characteristic features of this barn, as of the Swiss house from which it is derived, are:

1. The *basement* walled against the hill, used as stable for horses and cattle and sheep, and sometimes even for swine.

2. The *threshing floor* above the basement, with the mows on one or two sides constituting the part of the structure which was occupied, in the old continental house, by the family. This space is sometimes floored over, making another story under the roof, thus constituting a "double decker."

3. The *projecting roof*, or "*forebay*" (the Swiss German name), which is a direct survival of the projecting roof and balcony of the Swiss house.

4. The *bank*, or inclined driveway up to the threshing floor. This is the survival of the driveway into the loft barn of the Swiss house. So persistent is the type and tradition that not unfrequently an artificial bank is thrown up, if the barn is built on a level spot, thus keeping intact the basement idea for stable rooms.

5. The *notched* or *indented roof*. Originally in the Swiss house this opening in the roof furnished an entrance at least for light into the dwelling part of the house and a larger opening into the barn. In the American survival this is used as a large door, or double door, opening into the threshing floor of the barn from the bank, furnishing ample room for the entrance of a loaded hay wagon.

Other features of the Swiss house surviving in the American barn are the ventilators, which replace the chimney of the Swiss house. In the older forms these ventilators resemble chimneys and are made of wood. Specimens of barns have been found with as many as nine of these ventilators. A further development of the ventilator now popular in the newer barns is the spire or cupola type, usually three in number, the middle one being taller than the other two. This, of course, is for ornamental effect. Side by side with these projecting ventilators, many barns are found with apertures in the gables, sometimes in very graceful forms, instead of ventilators of the chimney type. The gable apertures are the direct survivals of the gable openings in the Swiss house. A still more curious form of ventilator is the use of dormer windows or roof windows, which give the barn the appearance of a house. These windows are, of course, the direct survival of the windows of the house, as are also the gable windows of the barn.

It is also striking that the Swiss barn in America stands out boldly as on its native Swiss hillside, with sometimes one or more unimportant outbuildings, such as the corn crib, pig pen and the like, and the typical American barnyard in front of the stable.

The building material in America consists of masonry up to the barn floor, and in many cases of brick or stone gables. The structure of the barn otherwise is usually of wood, although brick or stone barns can also be found.

This unmistakable survival of the Swiss barn, traced by a comparison of the structure itself with that of the Swiss original, is further corroborated by the names still given these barns in America. They are called in English "Swisser barns" or "bank barns;" in the Pennsylvania German dialect they are called "Schweizer Scheier" (N. H. G. Scheuer). The presence of these Swiss barns in Lancaster County is esaily explained by the fact that Swiss farmers, Mennonites and Amish were the first and most influential settlers in Lancaster County.

The trails of these mighty barns into Maryland and the

Valley of Virginia, into Western Pennsylvania and the Valley of the Ohio, on into the far West, and even into New York and Canada, and of late years into Delaware and the Eastern Shore, mark the routes along which the Pennsylvania German farmer passed in developing the agricultural resources of this country. Not only the non-Swiss German farmers, but also those of other nationalities, adopted this most economic and useful structure in many parts of the land. It is not too much to say that the German farmers, with their careful method of fertilizing the soil, of alternating the crops, of raising hay, and turning straw and other products into fertilizer, with their mammoth storehouse, the barn, and the heavy Conestoga wagon, were the founders of the agricultural prosperity in America and of our inland trade.

SCIENTIFIC MANAGEMENT IN EDUCATIONAL ADMINISTRATION

By Harlan Updegraff

Professor of Educational Administration, University of Pennsylvania

Scientific management means the conduct of an institution or enterprise in the full knowledge of all conditions involved in its operation and with a clear idea of the ends which it is intended to achieve. It means, further, that upon the basis of the ends to be reached and the conditions involved, there are observed certain forms of organization and processes of work that seek to produce the maximum result or product with the greatest efficiency, or obversely, with the least waste of time, effort and materials.

The desirability of making efficiency studies in the schools is apparent when we consider the vast amount of wealth and of human energy that is expended annually in the cause of education in this country. The latest statistics available from the report of the United States Commissioner of Education, while incomplete, show that about two and three-quarters billions of dollars are invested in productive funds, property and equipment, approximately three-fourths of which is represented in public institutions. The payment for the support and extension of these institutions amounted in the single year 1910–11 to over six hundred sixteen million dollars, a very large proportion being expended in public education. In fact, over one-third of our state and local taxes go to the support of public schools, and, including the expenditures of the national government, over one-fifth of all the moneys paid out in all the country for public purposes. During this year, two persons in every nine were attending school, while approximately six hundred

thousand adults were engaged in teaching, or about one in every one hundred fifteen adults of our population. So whether the matter be regarded from the point of view of capital invested, of current expenses, of teachers, or of pupils, or from all these factors in combination, the importance of making careful inquiries in order to ascertain whether greater efficiency can be secured is readily seen.

The purpose of this paper is first, to examine certain of the more important principles that have been recognized in the scientific management of industrial and commercial enterprises from the standpoint of determining in how far they may prove applicable in education, and then to indicate how much progress has been made in the introduction of such procedures as exemplify these principles. We shall first consider the general principles dealing with organization and ideals.

1. The form of organization must be simple, plainly understood and arranged along functional lines. Responsibility must be definitely fixed and commensurate authority must go therewith. In the division of responsibility and authority, proper regard must be paid to the lines of cleavage determined by the functions to be performed. Overlapping and short-reaching are both to be avoided. The checks and balances should also be within functional lines and should be as few in number as the conditions permit. All responsibility should merge in a single head whose function it is to regulate the work of all parts in such a way as to secure the greatest efficiency in the entire system.

On the whole, it cannot be said that this principle is generally observed in the schools of the United States. Organization has grown by process of small accretions without sufficient reference to a systematic, efficient plan. The principle is violated when school board members or trustees perform executive duties such as the actual purchasing of supplies; when they disregard expert judgment and follow their own upon professional or technical questions. It is violated by superintendents when they seek to put in force their own opinions upon legis-

lative matters without presenting them to the board. It is violated when a large number of committees have a hodge-podge of duties to perform; when executive officers have responsibilities in unrelated fields, and when they have duties more or less parallel in the same concerns.

2. Clearly defined ideals known and striven for by all must control the work of every person engaged. The particular part of the general aim which his work achieves must be clearly understood by each worker.

What is our aim of education and what is the particular aim of the teacher in the fourth grade? We can give a broad aim in general language which we believe satisfactory, but can we deduce from it working principles that will serve as guides? In this, we might as well admit we have not gone far. A maze of difficulties confronts us. The way out is through a scientific study of the actual facts in concrete situations, using in so far as is possible the methods of modern educational statistics and measurements.

3. Ideals and plans of action in pursuance thereof must be the product of sound common sense applied to the present and local situation in the light of all the factors in the past locally and elsewhere, and in the probable future, that have a bearing upon the problems in hand. Temporary ends must be subordinated to ultimate aims. The application of this principle is necessarily bound up with the preceding one. But aside from those relationships, it may be said we frequently err in this respect. A course of study used in one city or institution is copied by another when conditions are so different as to make it a misfit. Likewise, methods of teaching are followed which are actually harmful in one situation, although right in another. Our present tendency is not to discriminate closely, not to look far ahead, not to see the educational process in its relation to the needs of social life. The operation of this principle will not be accomplished until teaching becomes a profession and admission is restricted to those who have obtained adequate technical preparation.

4. A staff of experts in addition to the rank and file is needed to supplement the work of the line officers—the superintendent, his assistants and principals—by way of giving them counsel based upon efficiency studies of the work done. This staff should be experts in efficiency engineering in educational matters, capable alike of studying ways of measuring abilities and growth, of standardizing conditions and operations, of fixing schedules, of ascertaining educational needs and of constructing standard practice instructions in accordance with the conclusions reached. The number in this staff should, of course, vary with the size of the system, but as a matter of fact, many cities will doubtless have to get along for many years without full time service of such special experts. While technically trained superintendents, principals or teachers may do something in this way, yet the character and amount of their regular duties will in most cases prevent the full attention to efficiency problems that the conditions demand. Nevertheless, the wider knowledge, practical experience and sober judgment of the line officers should remain superior to that of the staff. Expert knowledge implies to a greater or less degree a narrowing of the range of view. The capable head of a system is, with his wider view and more extended experience, most competent to review the conclusions and the evidence and to determine their true bearing upon the situation in question. But without such a staff, the workers at the bottom—the teachers—with the least time to plan, the least training, the least compensation, will largely determine the entire process of instruction, each in his or her own way, and oftentimes at cross purposes. To make all teachers, or even more than a small fraction of them, efficiency experts is impossible; but granted that all could become such, they would not have much time to give to efficiency studies. We have long heard the cry for better prepared teachers; let us now add to it a plea for a staff of efficiency education engineers who will constantly keep revised up to the latest knowledge, standard practice instructions for each teacher in the form of standards and methods of teaching.

5. Every worker of high or low degree should make an honest and faithful effort to co-operate in carrying out the policy adopted for the system not only in such a way as will produce the best product, but also such as will promote the highest good to all his fellows. This means, on the one hand, that teachers should receive adequate pay, with efficiency rewards for superior service, should not be overworked, that each should be given the work she can do best, that superintendents and principals should do those things that will assist teachers rather than those that please themselves and that the fullest co-operation should exist between them; it means, on the other hand, that teachers should give a fair deal to the superintendent and principals and should do all in their power to facilitate and improve their work and to carry out their instructions.

There are two types of school systems in our country today which illustrate the presence and absence of the principles thus far enumerated. They do not differ so much in form as in spirit. In the one, the acts of many persons from the highest to the lowest in the ranks are animated by selfish motives. This type may be characterized as self-centered, disparate, inactive, destructive. The spirit of the other is that of service and mutual helpfulness. It is co-operative, unified, active, constructive, in its workings. In the former each does as little as he can and tries to make the other fellow do the essential things. A large majority are desirous of doing no more than is necessary to maintain their positions. Those in authority direct and do not suggest, inspect and not supervise, report and not assist, dominate instead of inspire. Those subject to authority, on the other hand, obey the letter in so far as is necessary, but no more; they contribute little or nothing to the knowledge or experience of their superiors, but drift along with little show of initiative. They do not have common interests nor think and act on common problems. An example of this type is found in a certain Western city whose school system has recently been examined by a group of experts. In their report they speak as follows:

"That the system of supervision had not been developed along good strong lines was evident almost at once. Looking at the system from the outside, and in the light of good administrative principles, it at once gave the impression of lacking self-reliance, and of being weak from over-direction from above. This fundamental weakness seemed to pervade the whole supervisory system and to extend from the top downward. The system seemed to lack character and strength, and seemed to be more of a system of inspection and reporting than a system of helpful educational leadership. The system seemed to be suffering from too many rules and too little personal initiative, and, as a result, to be realizing but a low percentage of its possible efficiency. The over-direction seemed, in a way, to be stifling the growth of those in it and in part paralyzing their impulses to individual action."

On the other hand, witness the spirit pervading in a small city of the Middle West. Here, teachers, supervisors, principals and superintendent meet on an equal plane in the fortnightly consideration of common problems to the solution of which the most recent and effective methods are applied. Between meetings each teacher is seeking the raw material, the facts, that form the basis for the study. The superintendent is at the same time developing the method and checking the results. All share in the satisfaction and joy of the conclusions reached. A spirit of mutual understanding, helpfulness and co-operation pervades such a system and progress must perforce follow. The first type of organization is productive of waste and is inefficient; the second conserves all possible forces and is efficient. At present in several cities in this country an unfortunate separation between teachers and supervisory officers seems to exist. It is high time that both sides realized the importance of mutual co-operation in a worthy service whose aim is far above their own individual interests.

The discussion now turns from the more general principles relating to organization and ideals to those involving scientific measurements.

6. Reliable and adequate records for determining costs and efficiencies must be kept. Cost records should comprise cost of instruction, operation, maintenance and certain miscellaneous charges, each divisible into cost of materials and of services as determined by price and quantity. Investment charges should likewise be added, although the custom has not become so well established. Efficiency records are as yet in a large measure unformed. They would fall under the same heads as records of cost. As they imply standards, more will be said of them in subsequent paragraphs, but because of the meagerness of the efficiency records, statistics of cost must for the time being necessarily omit the element of efficiency.

Absence of reliable and adequate records has limited and still limits the scope and effectiveness of educational studies. A national campaign for the establishment of cost and efficiency records was inaugurated in 1910. It bore fruit in the report in 1912 of the Committee of the Department of Superintendence of the National Educational Association on Records and Reports, drafted with the co-operation of the United States Bureau of Education. A uniform pupil record and a uniform fiscal report for all local and state public school systems that also determined the classification to be used in fiscal accounting, standard definitions of fiscal items and of attendance items, uniform blank for presenting age-grade census of children enrolled, and uniform blank for recording enrollment, promotions and non-promotions by grades were the most prominent forms of records recommended. The general adoption over the entire United States of many of these recommendations covering a very limited scope indicates the favorable attitude of progressive schoolmen toward the introduction of efficiency records and marks the beginning of the new movement.

7. A school system should be so organized that each pupil will work at all times upon those things which are best adapted to his interests, abilities and needs and will advance through the program of studies at that rate which is best for him. This implies the first principle—a definite ideal for each kind of

school or program of studies and for each grade. Beyond this it requires a program of studies for every class of pupils as differentiated on the basis of abilities, interests and needs. It stands also for physiological and psychological study by an expert staff, of each pupil to assist in determining which kind of school or program of study is best for him. Furthermore, it demands that the various parts of the courses in the different programs of study within one type of school and between lower and higher schools shall fit together in such a way that there will be a minimum of waste.

In commercial life this is known as the principle of dispatching. It has been brought to the highest perfection in one feature of railroading, hence the origin of the name. The analogous situations in railroad and school organization will serve to make more plain the application of the principle. As passengers are going to different destinations and so are put in separate trains, education has different kinds of schools for those who are going into different activities in life. There are differences among railroads and schools alike as to the distance from the starting point all persons are carried along the same main line. One of the most warmly debated questions in education at the present time is whether differentiation shall not be carried down from the higher and secondary schools in the establishment of separate programs of studies or separate schools for those going into industrial and commercial life and for those intending to enter the professions. As has been said before, such a course of action would promote efficiency in elementary schools which are now fairly well adapted to the end they serve—preparation for higher schools, or the professions. The opposing arguments upon this question are not from this point of view, but on the grounds of social expediency, and cannot be entered upon here.

As railroads discriminate between classes of passenger and freight traffic and have different kinds of trains and cars for each, so have schools established special courses of studies for those of peculiar abilities—for the backward, the incorrigible,

the truant, the immigrant, the feeble-minded, the deaf and the dumb. These special courses may be said to be recognized as desirable throughout the entire country. It seems likely, however, that as a result of scientific studies, a better classification of special courses will be brought about.

In the organization of classes so that each pupil may advance at that rate which is best for him, there is still much to be desired, notwithstanding much progress has been made. In many school systems there is still but a single track; all kinds of traffic are placed on the same trains and there is only one train in each of the eight divisions of the system. The only variation of this order is when the dispatcher picks up a pupil of higher ability and puts him ahead in the advanced division; or perhaps it is the reverse, and a pupil of lower ability after reaching the end of a division is put back to the next division point below, to go over again the same route on another train running at the same uniform rate of speed. This is not good dispatching. We must recognize, however, that in schools, as in railroads, the number of trains depends upon the amount of traffic. We must have mixed classes containing pupils of all grades of ability in smaller towns, the same as we must get along with mixed trains on small railroads. But there is no more excuse from the standpoint of efficiency for such mixed classes in larger systems than there would be for the Pennsylvania Railroad to put together in one train both freight and passenger cars and run all trains at the same fixed number of miles per hour.

8. Schedules fixing the rate at which pupils of varying degrees of ability can accomplish, with the use of the best methods, the standards of work fixed for each course with the least effort and with the maximum product should be worked out by efficiency experts, and individual pupils should be studied from time to time, especially when mal-adjustment seems probable, to ascertain whether the pupil is making advancement at the rate best adapted to him.

In the application of this principle of time schedules in a

scientific manner we have made little advancement. In consequence there has been tremendous waste of time and energy and a lessened amount of product. In our cities the percentage of pupils that are one or more years behind their normal grade as determined by age varies from four per cent to seventy-four per cent, with the median or average near thirty-five per cent. This means that one-third or more are in a program of studies that is timed too fast for them as now carried out and there has been repetition of work involving much waste.

Furthermore, our classification of pupils from the standpoint of mental ability in our present organization has been said to be faulty, if the results of careful study are to be credited. The brightest pupils in one grade are in reality of as good ability as a majority of the pupils in the second grade ahead and, as found in one investigation, over three-fourths of the pupils in a lower grade were of greater ability than the worst pupils two years in advance. So, as a matter of fact, we are not apparently promoting pupils in accordance with their ability. Our measures of ability are partially false and our standards faulty. The work of the expert in this field is much needed, but advancement can be made only as we evolve scales of measurement and establish standards. This leads to our next principle.

9. Scientific management requires the most accurate standards that it is possible for careful, exact study and measurement to obtain—standards relating to conditions that determine the kind and amount of work to be done and standards of operation that fix the ways it can be best done. Standardized conditions, standardized operations and time schedules react on each other and it is the problem of the efficiency engineer to find the best combination. In certain industrial and commercial establishments the work of these experts has been brought to a high degree of perfection with great advantage to their owners, their employees and to the public.

But the measurement of the educational materials, processes and products is of a far different character from the measurement of material things. The lack of constancy of performance

of the same individuals, the variability among individuals and the difficulties in obtaining units of measurement make such a possibility seem to many minds almost hopeless. These characteristics of mental measurements have, doubtless, caused many learned men of scientific training and temperament to follow individual experience and to give undue weight to conservative influences in educational matters. But through the development of psychology, and more particularly of educational psychology and the evolution of statistical methods, it has now become possible for us to measure educational processes to a certain extent, and doubtless with the continued advance of these sciences the fields that may be measured will be widened.

Standard conditions, operations and schedules should in their full development recognize both efficiency and cost and determine those combinations of time, effort and cost which make the best product with the least waste. Because of absence of scales of measurement for determining standards and products of mental life, the first efforts toward measuring efficiency in school systems have had to take certain rough measures of amount of product and to proceed on the supposition that the quality was the same. A year's instruction of one child has been generally used as such a unit. The costs of various cities —preferably those in which similar conditions existed—are compared, and of the costs within one city of different subjects in the high school or of different schools. The number of children promoted has also been used as a measure, but the liability of its abuse has made it impracticable unless inspection is ample and close. Such comparisons of costs have been of greatest service indirectly in promoting better schools. Extreme excesses or deficiencies in unit costs, or in per cent of total taxes spent for schools, have been discovered and after careful inquiry have been justified or corrected. It has been particularly valuable in securing larger appropriations for schools in cities and towns spending low relative amounts by furnishing data for appeal to local pride.

Similarly, comparison of time spent represents an effort to

promote efficiency. Time allotment schedules for various or all subjects in the curriculum are compared with similar schedules in other cities and in case of extreme variation, careful inquiries are instituted and possible changes in schedules result.

While such measures of efficiency as these have been useful, their shortcomings are apparent because they do not adequately measure the educational product. While it seems to us that many educational products will defy measurement through all time, yet there are some that can now be measured by scales of measurement that are quite as accurate for all practical purposes, although not so precise, as the foot rule or pound weight for the measurement of length and mass. Through their use we can compare ability of different pupils or of the same pupils at various times. We can, when a sufficient number of measures have been made, establish standards as to abilities to enter upon various courses, to complete various courses, and the best method to obtain a given product. We can also decide as to rate at which each pupil should progress. The modified Binet-Simon tests, the Thorndike scales of measurement of writing and drawing, the Hillegas scale of measurement of composition, the Courtis tests in arithmetic, reading and writing, the Stone tests in arithmetic, the Ayres scale in writing and the Bonser tests in reasoning abilities are among the most notable. Psychological and educational laboratories in universities and studies in many schools over the country are gradually adding to the number of the scales of measurement and better standardization of those already devised. Several features of these measures should be noted:

(1) They are divisible into two classes: (*a*) Those in which models of varying degrees of merit from a little above zero to the highest that is likely to be attained make up the scale. Any sample of a pupil's work, as of writing or drawing or composition, can be compared with the various models in the scale and a value assigned to it accordingly. (*b*) Carefully prepared and tried tests are given the pupils within a stated time and the papers are rated according to carefully prepared and tried

instructions. This method works best when each part is rated as either right or wrong, as in the Courtis tests in arithmetic.

(2) They are difficult to prepare and should not be attempted by any one who is not an expert. Tests for individual city systems may under peculiar conditions be framed, but teachers are not competent to prepare them. An expert staff to prepare, conduct and rate such tests in the working out of efficiency problems is most to be desired.

(3) Practice is required to use the scales satisfactorily, just as some experience is desirable for making accurate measurements of weight and distance.

(4) The scales and tests are not fully perfected.

(5) Groups or classes of pupils can be compared with greater accuracy by a single test than individuals. This is due to the lack of constancy in individual performances, the variations in which offset each other in the group. To measure the individual several measurements are necessary.

(6) Greater preciseness will be attained in some cases if more than one person grades.

(7) Both group and individual accomplishments can be most accurately expressed by measures of central tendency or average and average deviations therefrom.

Only a small beginning has been made in the application of scientific measurements to the establishment of standards and schedules, but the outlook appears favorable to its extension. Nevertheless, progress will be slow because of the difficulties that will be met. Based upon present practice in cities it is now possible to standardize conditions for each grade in arithmetic and writing, and within a brief time such can be done in reading and drawing and composition, although the scales of these latter are still unsatisfactory.

10. Standards of condition and of operation and time schedules will have their issue in standard practice books. Just as in the making of an automobile, the making of each part is standardized as to the factors entering into its composition and its completed form, as to the particular motions that are best

adapted to the process, and as to the amount of time to be consumed, and a book of instructions is made up containing the results of experiments and of experience up to date for each worker to follow, so in schools we shall have a loose leaf typewritten book which will furnish to each teacher the results of all research and experience in the teaching of each part of each subject that falls in her field as worked out both in her own school system and elsewhere.

Some of the statements made in this paper might be interpreted as a reflection upon the schools and the teachers of this country. They should not be so construed, and they will not be by those teachers who have an intelligent, sympathetic attitude toward their work. In fact, the deficiencies in the school are not the fault of the teachers so much as that of the people. Professional teaching is generally regarded as in its infancy. Education would have progressed much more rapidly if teachers had received sufficient encouragement to make better preparation, if the people did not often seem to favor poor teachers and bad teaching, and if teachers had not often been prevented from carrying out measures which would have improved conditions. Still teachers should not quarrel with society. The profession of teaching and higher efficiency in schools is in the process of evolution. Teaching is as far advanced professionally as was medicine less than one hundred years ago, and as conditions are more favorable, we may look with assurance for its full professional recognition within a less number of years. Dr. S. Weir Mitchell, in his novel, "In War Times," attributes the professional recognition of medicine to the services rendered by physicians in the Civil War. Our recognition may come through some crisis in social life which will place the dignity of education on even a higher level because of its more fundamental character, as has been the case in Switzerland and Denmark. In the meantime, we who are within the ranks are struggling loyally ahead, fully cognizant of our shortcomings, yet desirous of maintaining the fullest possible efficiency, believing that our labors are not in vain and

that through the application of scientific method we are bringing constantly nearer the day when education will come into its own. If you doubt it, witness the thousands of teachers that every summer are giving up their time and meager substance to improve themselves in the summer schools of universities and colleges throughout the land.

Finally, it must not be forgotten that efficiency principles do not control throughout all establishments in industrial and commercial life. There are probably more examples of inefficiency in business than in schools, both absolutely and relatively, notwithstanding the fact that scientific management has had its fullest realization in such enterprises. The schoolman has just reason to be proud of what has been accomplished under the conditions he has had to face.

THE PLAYS AND POETRY OF JOHN MASEFIELD

By Cornelius Weygandt

Professor of English Literature, University of Pennsylvania

Mr. John Masefield is a writer as basically English as Mr. Thomas Hardy. When I have said that I have said that he is as native, as racy of the earth, as distinctive of the island character and outlook upon life as Wordsworth or Fielding, as Shakespeare or Chaucer. Like these great men his elders and betters, Mr. Masefield belongs to that England that has passed from the great cities forever, that is now passing from all parts of the north of England, the industrial radical North, but that still may be found here and there south and west of the Thames.

When I think of Mr. Masefield I think first of life in old country places, a life of simple folk of intense passions, elemental men and women who act on impulse, who struggle against fate, know joy keen and mad for a space, and then, still in youth, the sorrow that, sooner or later, comes to all. There are few complexities in his poems or plays: they can be understood of all men; they are of common things, but they never are mean. Now Mr. Masefield writes of things goodly and grave, the things that have the quality of the King James Bible or of the timbered house of times before King James; now of things sweet, as the blossoms of the May falling through moonlight; now of things rude and elemental and wild like great winds through the oaks of Dean or great tides on Severn Strath.

It is the west country that has made Mr. Masefield, the counties of the Welsh Marches, Shropshire and Hereford, Worcester and Gloucester—the west country and the sea. But sponsors he has, too, in books, the King James Bible; and the pæans of our own Whitman; and the stories and verses of Mr. Hardy. So it is I would take as texts from which to speak on Mr.

Masefield certain passages from the Old Testament, and certain other passages from Whitman and Mr. Hardy. Is it not inevitable when you read the sea verse of Mr. Masefield that those words so familiar and so long prized of the 107th Psalm raise their chant in your ears:

"They that go down to the sea in ships, that do business in great waters."

"These see the works of the Lord, and His wonders in the deep."

And I, for one, cannot read many of his verses of wayfaring in the west country but there comes back to me through the years line upon line of Whitman, oftenest, however, those declarations high-hearted and ablaze with sun, of "The Song of the Open Road"·

Afoot and light-hearted I take to the open road,
Healthy, free, the world before me,
The long brown path before me leading wherever I choose.
* * * * * * * * * *
I inhale great draughts of space,
The East and the West are mine, and the North and the South are mine,
* * * * * * * * * *
I will toss a new gladness and roughness among (men and women).

So, too, to me as I read "The Widow in the Bye Street," or "The Daffodil Fields," those words august and final of Mr. Hardy rise troublingly into consciousness, "The crash of broken commandments is as necessary to the close of a tragedy as drum and cymbals to a triumphal march," and with these words memories of the lives that illustrate them, of Marty South and of Tess, of Clem Yeobright and of Michael Henchard.

These then are the chief topics of Mr. Masefield—the sea, the joys of wayfaring, and the love of man and woman. There are other topics, too, that he writes of, but they are generally involved with one or the other of these three themes. The call of home, and the reading of life, the philosophy of Mr. Masefield, are the two other leading themes, but the call of home is so generally fused in his song with the joy of journeying west

country ways that it is difficult to say whether the one or the other is dominant in this poem or that. And in few of his poems, objective though he try to make them, do we escape altogether his philosophy.

Though it is of Shropshire that Mr. Masefield writes oftenest in his narratives of west country life, it would seem that Gloucester was his home county. I do not know otherwise how to interpret his references in "Ships." In this poem, and in that other entitled "Biography," he tells us of the great moments in his life, at sea and ashore, in England and in America, in northern waters and under the southern cross, but with such scant detail that we get few facts to add to the little he has been willing to tell his many interviewers. That he is forty and the son of a Gloucester solicitor we know; that he went early to sea on a mercantile training ship and eventually shipped before the mast; that he tramped it and worked as a farmhand up York State; and, in some detail, that he served as bartender in a New York saloon. A sketch of his records this last experience, but in that he does not say, as he does in conversation, that the greatest moment of his life to him in these years was his serving Fitzsimmons with a drink—Fitzsimmons the great, I mean, Cornish Bob. That was the heroic episode of his months in the Sixth Avenue resort.

After these experiences Mr. Masefield returned to England and from 1901 on he led a more settled life, marrying and settling down to the comparative humdrum of a man of letters who could not get along without hack work. He edited Elizabethan plays, he wrote historical accounts of seafarers of all sorts; he ground out boys' books which my nephew of fourteen tells me have " 'Treasure Island' skinned a mile;" and he evolved, rather laboriously it would seem, three novels. All the time his heart was in his verse, and in his plays which, though not in verse, are thrilled through with poetry. He lives now, in winter, in Hampstead, and, in summer in a little village in Buckinghamshire, Great Hampden, with his wife and boys. There he was visited by Mr. Cournos, of our own city, who has, so far as I

have read, written the interview in which is most of the personality of the man.

His first volume of verse, "Salt Water Ballads," was published in 1902. This attracted comparatively little attention from the public, though it was at once recognized in the literary papers and found its way quickly into the affections of all who care greatly for poetry. "The Campden Wonder," a play, made no such effect upon the public upon its presentation in 1907 as did the tragedy of "Nan" a year later, in 1908. "The Campden Wonder" was simply a horror, whereas "Nan," bitter tragedy that it was, was, too, a thing of beauty. These two plays and "Mrs. Harrison," a sequel to "The Campden Wonder," were published together in 1910. Meanwhile, "Captain Margaret," a novel of the sea, had been published in 1908. In 1910 came "The Tragedy of Pompey the Great," but none of the plays save "Nan," nor "Captain Margaret," nor "Multitude and Solitude" and "The Street of Today," the last two of 1910—made any considerable impression, and "Ballads and Poems" (1910) interested only those who had previously been interested in "Salt Water Ballads." In other words, save for "Nan," which had had a success of estimation on its presentation by Mr. Hignett and Miss Lillah McCarthy, under the direction of Mr. Granville Barker, in 1908, Mr. Masefield was unknown of the English-speaking public when "The Everlasting Mercy" appeared in the *English Review* for October, 1911. So great was the interest created by this poem, a poem telling the story of the conversion of a poacher, that the magazine was reprinted several times. Mr. Masefield had at last come into his own. Is it not symptomatic of our time, or is it only symptomatic of human nature of all times, that the world should pay heed to the bold beauty of this poem after having refused notice of the equally great but quiet beauty of his earlier lyrics? Perhaps the real reason of the interest is to be found in the fact that "The Everlasting Mercy" told a story, whereas the earlier lyrics were but the expression of moods. "The Widow in the Bye Street" followed close upon "The Everlasting Mercy," and

"Dauber" close upon "The Widow in the Bye Street." It is said that Mr. Masefield wrote all three of the poems in one great fit of work in the summer of 1911. Certain it is that by the autumn of 1912 all three were before the public. "The Daffodil Fields" completed the quartette of his long narrative poems early in 1913. Since then we have had two slighter narratives, "The Wanderer" last fall and "The River" this winter.

It is, as I have said, upon "The Tragedy of Nan" (1908) and upon the four long narrative poems published in the *English Review* during the last three years that the popularity of Mr. Masefield rests, though we must not forget that this popularity is the result of no sudden flowering of genius, but that Mr. Masefield had been for ten years before his "success" a writer of lyrics that had made their mark in the world and that would have ultimately found their way into the anthologies and won him distinction.

I do not know of a certainty how it was that Mr. Masefield came to write verse, but I do know how it was that he was encouraged to write the kind of verse that he wished to write and how that writing was brought before the attention of the world. The interest of Mr. J. B. Yeats in the sea had brought him into contact with Mr. Masefield, and it was not long before the painter brother had brought Mr. Masefield to the attention of the poet brother, Mr. W. B. Yeats. You will find in the "Salt Water Ballads" Mr. Masefield's first volume of verse (London, 1902), that "The Tarry Buccaneer" is dedicated to Jack B. Yeats and "A Wanderer's Song" to W. B. Yeats. Mr. W. B. Yeats encouraged Mr. Masefield to continue to write out of his own experiences of life at sea and over seas ashore and to make a new sort of beauty out of the rough life of the sailor, and when the poems were published Mr. Yeats called them to the attention of the world by talking and writing about them in season and out of season.

As you think back over all English sea poetry it is surprising to realize how little of it is written "from the inside." As one

reads the Old English "Seafarer," and learns how the poet mariner who writes it tells of his keeping of "the narrow night watch" at the prow of a viking ship on a night of winter when that ship beat off a rock-bound coast and was lashed by showers of hail as well as the wild sea, one feels that that author knew the sea intimately. But there are few such intimacies in the sea poetry that follows down the centuries even to our own time. There is not one of our subsequent English poets of power who was a sailor or who sought material for his poetry in the every-day life of the sailor, unless you make exception of Sir Walter Raleigh or of the Rev. T. E. Brown, the author of the "Fo'c's'le Yarns" of a generation ago. Thomas Lodge wrote his "Rosalynde" aboard ship on the Spanish main, but there is no savor of the sea about it at all. The great sea poetry that we have is almost wholly the work of landsmen. Stories of the sea like Mr. Masefield's "Dauber" we are almost without. It was such stories as this, out of his own life at sea, that Mr. Yeats urged him to write. "Our true sea epics," Mr. Masefield himself wrote in his collection of sea songs and chanteys, 'A Sailor's Garland'—"our true sea epics are written in prose rather than verse." This declaration, made in 1906, antecedes Mr. Noyes' "Drake," but I doubt whether Mr. Masefield would change his verdict even because of it, and put "Drake" along with the wonderful narratives that are published by the Hakluyt Society. Mr. Noyes is, after all, like Mr. Kipling and Swinburne, but a landsman.

The sense of obligation that Mr. Masefield felt toward Mr. Yeats is again expressed in the dedication to "Nan" (1908), but you must not think that Mr. Yeats' encouragement of Mr. Masefield led Mr. Masefield into aping the writing of Mr. Yeats. There is little influence of Mr. Yeats' lyrics even in the early lyrics of Mr. Masefield. It is not Mr. Yeats' way when he encourages a writer to lead that writer to imitate him. His encouragement is rather toward the finding of that writer's self by himself. It was so that Mr. Yeats encouraged Synge; it was so that he encouraged Lady Gregory; and it was so that he

encouraged our own Pennsylvania poet, Mr. Ezra Pound. It was, in short, the way of Coleridge in stimulating Wordsworth and Hazlitt, Lamb and DeQuincey, not one of whom imitated him in any material way whatever, but each of whom made confession of large obligations through suggestion and the widening of horizons.

Nothing could be more unlike Mr. Yeats than the ballads in the lingo of the fo'c's'le which make up the bulk of "The Salt Water Ballads." The most of these are narratives, rough and ready, and celebrant generally of storms or shipwreck, or death, or of the joys of the brief times ashore. There is, too, a group based on the chanteys or songs sailors use as they raise anchor, or pull on the halliards, or go about this or the other avocation of the ship. Here is the brisk onset of one that records what happened to a man who caught a crab in a regatta.

Your nose is a red jelly, your mouth's a toothless wreck,
And I'm atop of you, banging your head upon the dirty deck;
And both your eyes are bunged and blind like those of a mewling pup,
For you're the juggins who caught the crab and lost the ship the Cup.

As one would expect, Mr. Masefield writes of the sea with absolute authority, an authority come of the intimacy of years. Mr. Wesselhoeft, of our faculty, who was at sea many years, says he has read no writer in either English or German—and I believe there are few in English or German who have written of the sea that Mr. Wesselhoeft has not read—Mr. Wesselhoeft says that there is no writer of the sea in English or German who has written with such accuracy and understanding and powers of interpretation of sea life as Mr. Masefield. I have no time to be reading many of Mr. Masefield's poems, but I cannot refrain from "Sea Fever:"

I must go down to the seas again, to the lonely sea and the sky,
And all I ask is a tall ship and a star to steer her by;
And the wheel's kick and the wind's song and the white sail's shaking,
And a grey mist on the sea's face, and a grey dawn breaking.

I must go down to the seas again, for the call of the running tide
Is a wild call and a clear call that may not be denied;
And all I ask is a windy day with the white clouds flying,
And the flung spray and the blown spume, and the seagulls crying.

I must go down to the seas again, to the vagrant gypsy life,
To the gull's way and the whale's way where the wind's like a whetted knife;
And all I ask is a merry yarn from a laughing fellow-rover,
And quiet sleep and a sweet dream when the long trick's over.

Lovely as this poem of the lure of the sea are those that celebrate beautiful waters in far parts of the seas. Best of all the poets who have written of the Indies and Eldorado, Mr. Masefield has caught the dreamy languor of the isles of the Spanish main. "Spanish Waters" expresses their very atmosphere, and so, too, does "Trade Winds." Much, too, of the glamor of these southern waters you find in the short tales of his "Tarpaulin Muster" and in his long novel of seventeenth century sea life, "Captain Margaret."

The last two long poems of Mr. Masefield, "The Wanderer," which was in last September's *Harper's* and "The River," which was in the January *Century*, are both of them of the sea, but they have neither of them the body of the four great tales in verse, "The Everlasting Mercy," "The Widow in the Bye Street," "Dauber" and "The Daffodil Fields." "The Wanderer," is, however, a thing of pure beauty. Something of that ship's story we had already come upon in Mr. Masefield's "Ships," but now we get her complete story. It isn't very much, perhaps, this story, the passing of a great full-rigged ship from port three times, and three times her return in distress. The first time she went out she met a blow that took her best set of sails; the next time a fallen spar killed her captain; and the third time an accident led her men to mutiny under the fear that she was a ship doomed; and they brought her back to lie a long time until the seafaring men had forgotten her ill-luck and a new crew could be secured. The story ends with Mr. Masefield's sight of the ship in a quiet haven in the south of England one Christmas time. There is the self-evident "if you don't at first succeed,

try, try again," as the moral of this story, but this is not, of course, the beauty of the story. The beauty is in the passionate description of what to Mr. Masefield is the most beautiful thing that man has made—a clipper ship.

"The River," the other of these last stories, tells of how the great ship Travancore is lost in the quicksands of an estuary of a great eastern river, seemingly the Ganges. The line to her tug parted in the whirlpool just within the river's mouth, and the ship getting beyond control, dashed on a wreck that was submerged there. A number of her men were imprisoned in the steel roundhouse by a mast falling and jamming its door. The particular story Mr. Masefield tells is of how one man from the moment of the imprisonment in the roundhouse set to work to dig out the lead that had been used to seal the door into the hold. He was jeered at by the other men, but he alone of those imprisoned escaped, the door at length unloosed, by plunging down into the hold and being thrown out one of the hatchways. The forces of the Hoogly—if it is the Hoogly—and the might of the river rushing to the sea are very well described, but one doesn't get the local color as one gets the River Platte and the inland pampas of Argentina in "The Daffodil Fields." "The River" is of all of Mr. Masefield's work of any pretension that which least satisfies and its weakness has led some of his admirers to wonder if he isn't forcing his production now that he has the ear of the world.

There remains to speak about, of the sea poems, "Dauber." It is not finer in quality than several of the sea lyrics but, because of its story, it has become better known than any of them. Mr. Masefield close packs "Dauber" with the beauty that he has seen at sea and in it he tells somewhat of his own struggle to attain beauty in words and a new beauty of life through the rough road of the sailor. Of course, it would be unfair to identify him in any detail with the hero of his "Story of the Round House." Mr. Masefield, no doubt, is strong where his hero is weak, but it is his own sensitiveness to beauty and picturesqueness that he records in following the story of his boy

from his youth on a Gloucestershire farm to his death at sea by a fall from the yards in a storm off the Chile coast. Joe's father wanted him to follow his farmer's life on Spital Farm, where the boy's grandfather, too, had been tenant, before his father, during Napoleon's wars. But the boy was his mother's son as well as his father's, and after he had found in a garret a book of sketches his mother had done, there was reborn in him the love of painting that his father and sister hoped had gone out of the family when wife and mother died. So strong, however, was Joe's predilection toward art that he became ineffective on the farm and spent all the moments that he had to himself in sketching. Quarrel followed quarrel until it was deemed best that the boy go away to live with his mother's brother, with whom he learned house-painting as a means of livelihood. But Bristol brought him not only a trade, house-painting, but knowledge of ships.

> And then one day I had a job to do,
> Down below bridge, by where the docks begin;
> And there I saw a clipper towing through
> The open gates; she was just entering in.
> Raked to the nines she was, lofty and thin,
> A skysail-yarded clipper so well kept
> She glistened like a racehorse as she stepped.
>
> That altered life for me; I had never seen
> A ship before, for all my thought of ships;
> And there was this great clipper like a queen,
> With a white curl of bubbles at her lips,
> All made of beauty to the stern's ellipse,
> Her ensign ruffling red, her bunts in pile,
> Beauty and strength together, wonder, style.

The sight of that ship put it into his mind to become sea painter, and so he shipped on a clipper bound for Valparaiso that he might become familiar with every phase of the life on board ship. Sensitive boy that he was, awkward and unused to rough ways, he soon became the butt of the ship. All sorts of tricks were played upon him, his sketches were washed out, and the moments of ecstasy he got from the beauty he saw in sail and water were intruded upon with gibes and ironic laughter.

When the ship was off Cape Horn in mid-winter Jim had to join a watch and go aloft in the wildest weather. Despite his terror and inexperience, he finally learned to reef well and won the respect of his mates. After that had happened, and a happy end to the poem seemed possible, it is almost wanton in Mr. Masefield to have Joe fall from the yards and be killed just on the eve of the ship's entrance to Valparaiso, and that, too, in weather not nearly so severe as much that he had come through safely. In many ways Joe is like the "Jude" of Mr. Hardy. He is like Jude in his artistic feeling and his sensitiveness, but he had no curse of women and drink in his life as had Jude, nor has he on the other hand that compensating strength of Jude that carried him through such difficulties as those in which Joe met his death.

What is most interesting in this tale is not what is most interesting in most of these tales of Mr. Masefield, that is, the story itself. What is most interesting in "Dauber" is the beauty that Mr. Masefield has gathered from his own experiences at sea. Again and again Mr. Masefield catches in words the thoughts that "occur within the painter's brain" like "bright birds." Mr. Masefield has conjured up for us pictures of men at work on yards and deck as vivid as any pictures of sea life in Winslow Homer. Take this for instance:

> A gantline swayed aloft
> A new lower topsail hard with rope and leather,
> Such as men's frozen fingers fight with oft
> Below the Ramirez in Cape Horn weather,
> The arms upon the yard hove all together,
> Lighting the head along; a thought occurred
> Within the Painter's brain like a bright bird.
>
> That this, and so much like it, of man's toil
> Compassed by naked manhood in strange places,
> Was all heroic, but outside the coil
> Within which modern art gleams and grimaces,
> That if he drew that line of sailors' faces
> Sweating the sail, their passionate play and change,
> It would be new and wonderful and strange.

And this:

> There the four leaning spires of canvas rose,
> Royals and skysails lifting, gently lifting,
> White like the brightness that a great fish blows
> When billows are at peace and ships are drifting:
> With mighty jerks that set the shadows shifting,
> The courses tugged their tethers: a blue haze
> Drifted like ghosts of flocks come down to graze.
>
> There the great skyline made her perfect round,
> Notched now and then by the sea's deeper blue,
> A smoke-smutch marked a steamer homeward bound,
> The haze wrought all things to intenser hue.

As we read pictures like these we think not only of what the world loses when it loses a man who has seen heroic life on the ship and could have painted it—we think not only of the dauber. We think also of what the world would have lost if Mr. Masefield had fallen from the yards at some such task as that which costs Dauber his life.

There is a prose epic of the sea of only a few years precedence of Mr. Masefield's verse epic with which to compare it, to test how original and beautiful are such pictures in words as those I have just quoted. There is "The Children of the Sea" of Mr. Joseph Conrad, which tells of the voyage of a full-rigged ship from Bombay to London as "Dauber" tells of the voyage of a full-rigged ship from London to Valparaiso. It is realist against impressionist this comparison, poet in verse against poet in prose. There is the beauty of the one, a beauty of clarities; there is the beauty of the other, a beauty of subtleties. Put the one against the other and your wonder grows and grows that the two so different men, both sailors and both artists in words, could achieve so differing results, each in its way of a supreme beauty. "Dauber," perhaps, closes the more memorably with a picture of the high peaks of the Andes clear and far above the alien shore, an ending that you must associate with such great endings as those of the "Morte D'Arthur" and "Sohrab and Rustum."

Mr. Masefield, as I have said, was country boy before he was sailor, and the life of the farm is just as well known to him as the life of the ship. It is not strange then that it is of country life he has written the greatest number of his verses of popular appeal. "The Everlasting Mercy," "The Widow in the Bye Street," and "The Daffodil Fields" are all three of the country, although, of course, "The Daffodil Fields" takes you over sea to Argentina. And in his lyrics you find about as many poems celebrant of the countryside that he knows—Shropshire and Hereford, Worcester and Gloucester—as of the sea. "London Town" tells us how he longs to be out of the city and off to his home country in the west:

> So hey for the road, the west road, by mill and forge and fold,
> Scent of the fern and song of the lark by brook, and field and wold,
> To the comely folk at the hearthstone and the talk beside the fire,
> In the hearty land, where I was bred, my land of heart's desire.

The west wind to him in London is the wind that blows from home.

> It's the white road westwards is the road I must tread
> To the green grass, the cool grass, and rest for heart and head,
> To the violets and the brown brooks and the thrushes' song
> In the fine land, the west land, the land where I belong.

By these extracts that I have read we have been brought to the second group of his poems, those that are born of the "wanderlust." "Roadways," too, well catches this spirit, and "Tewkesbury Road," but I have time to quote neither. I wish I had, and time, too, to put him among his fellows in the great and goodly company who from Widsith down have wandered to far places of the world. It is a great procession this, down the great way of English letters, the procession of those of the wandering heart, of the adventurers by sea and land, the wayfarers, the gypsy-hearted, the minstrel, the tinker, the pilgrim. Stay-at-homes fate makes most of us; but we chafe, do we not, to be like these wanderers, to be afoot on the road, to feel the

seas under us and a new horizon widening out each endless day of wonder that awaits us.

It may be strange to those who know Mr. Masefield only through his later rugged poems to find among his verses love lyrics of as gentle courtesy and distinction as our century has known. "Born for Nought Else" and "The Word" quarrel in my heart for first place with "Beauty," but it is oftenest that "Beauty" wins first place of the three. Here it is, so high a compliment to a woman's beauty and so sincere that I feel "compliment" too formal a word to mention in one breath with it.

I have seen dawn and sunset on moors and windy hills
  Coming in solemn beauty like slow old tunes of Spain;
I have seen the lady April bringing the daffodils,
  Bringing the springing grass and the soft warm April rain.

I have heard the song of the blossoms and the old chant of the sea,
  And seen strange lands from under the arched white sails of ships;
But the loveliest things of beauty God ever has showed to me,
  Are her voice, and her hair, and eyes, and the dear red curve of her lips.

I am not sure that I should call "The Widow in the Bye Street" a love poem in the ordinary sense in which we use the phrase. That it is a poem about love there is no manner of doubt at all, but it is almost as much about the love of a mother for her son as about the son's love for the woman that takes him from his mother. You all know how usual is the fear the mother has of the woman that shall take her son from her. As the old rhyme has it:

> Your son's your son till he takes a wife;
> Your daughter's your daughter all her life.

Years ago I called upon a member of our faculty. When I found my way into the living room, the rug by the fire was occupied by a youngster of two, kicking his fat legs ecstatically and viciously at me. His mother, running in to rescue

him, exclaimed, before I could, "Isn't he a dear?" and then, what I should not have thought of, "isn't it too bad to think that just about now there is being born into the world a girl to take him away from his mother?"

"The Widow in the Bye Street" tells the story of a widow and her son: of how she brought him up, his father being dead, and was all in all to him, and he to her until he was nineteen, when at a fair he met a light woman, then parted from her man, and was lured away from his mother. When Shepherd Ern, that man, returned to Anna, she told Jim he was not wanted any longer. There was a fight between the men, and Jim went away, brooded all night over his woes, went back to work as a navvie on the railroad and was "sacked," went to the inn and drank himself drunk, sought out Anna again, found her with Ern, and killed the shepherd with one blow of a spudder. Jim is tried and hanged, leaving his stout-hearted old mother, who has stood by him through it all, crazed. The poem ends with a picture of her singing the old song, "Binger," that she and Jim used to sing in the evenings when he was her good boy and brought all his money to her, singing and believing that Jim is still alive.

The characters are wholly believable in "The Widow in the Bye Street," and each is given personality and temperament as well as character and vivid appearance. You see and feel and understand the old mother and her boy Jim, the light woman who steals the boy from his mother, and the dark, moody man, Shepherd Ern, with whom she is infatuated. Jim is a good sort, silly, inexperienced, but red-blooded and honest-hearted. Anna of the "tired beauty" and stealthy face is a lure to all men. To poor Jim she is "a white rose faintly flushed with red." She is pleasant, soft, changeable, selfish, incapable of loyalty or affection, but decent enough to be troubled by her power over men, as well as proud of it, and disappointed into crying, "No man has given me the love I dreamed," and perspicacious enough to say that "life's a long headache in a noisy street."

There are poignancies in this poem almost unendurable.

One such is that of the little children of Shepherd Ern as they wait in vain for him to come home from the fair with presents for them. "He bought no fairings as he'd vowed to do" for his poor little children back at home "stuck at the glass to see till father come." More terrible than this is the end of the poor boy, his hanging, a scene to be remembered along with that hanging that brings "Tess" to its great close.

But the greatest passage of all in "The Widow in the Bye Street" is the full close. That has about it a clarity and home thrust, a dignity and uplift that is found only in our greatest threnodies. As one reads this, one thinks of Arnold's "Scholar Gypsy," of Lycidas and —dare I say it—of "After life's fitful fever he sleeps well."

Singing her crazy song the mother goes,
  Singing as though her heart were full of peace,
Moths knock the petals from the dropping rose,
  Stars make the glimmering pool a golden fleece,
  The moon droops west, but still she does not cease,
The little mice peep out to hear her sing,
Until the inn-man's cockerel shakes his wing.

And in the sunny dawns of hot Julys,
  The laborers going to meadow see her there.
Rubbing the sleep out of their heavy eyes,
  They lean upon the parapet to stare;
  They see her plaiting basil in her hair,
Basil, the dark red wound-wort, cops of clover,
The blue self-heal and golden Jacks of Dover.

Dully they watch her, then they turn to go
  To that high Shropshire upland of late hay;
Her singing lingers with them as they mow,
  And many times they try it, now grave, now gay,
  Till, with full throat, over the hills away,
They lift it clear; oh, very clear it towers
Mixed with the swish of many falling flowers.

"The Daffodil Fields" is the old unhappy story of the girl who loved the rover, who cared for her beauty and for her only

that little that jealousy of another will allow for a short space. Perhaps the girl, too, cared chiefly for the rover's beauty, and perhaps had not her husband gone wild at the sight of her lover at the last Mary and Lionel would have gone down the years contentedly together.

It is concerned with the daffodil fields along a Shropshire stream. Furthest up stream "Ryemeadows' Farmhouse stood," the home of the Grays; next down stream was Foxholes Farm, the home of the Keirs; and furthest down stream, and on the richest land, the home of the Occleves. This last named was called "The Roughs." The story opens with the death of old Nicholas Gray, who has but one son, Michael Gray, "Young April on a blood horse, with a roving eye," a line, by the bye, showing surely the influence of George Meredith. Michael Gray is away from home as his father is dying, but when Mary Keir comes in with Lionel Occleve to the dying man's house she insists that Michael be sent for. As she and Lionel go to the telegraph office Lionel declares his love; but she tells him that she is in love with Michael, who does not care for her. Just upon this they come on Michael singing on his way home. His father dies and Michael goes to live for a while with the Keirs. The girl thrown in his way, he falls in love with her as much as a man of his nature can fall in love with any woman; that is, he finds her fair and her devotion pleasing, and he thinks perhaps there is more than her fairness and her devotion to him in his feeling for her. Shropshire is too tame for this young man of wild blood, so he must over seas to make his fortune. He goes to the Pampas in Argentina, plighting troth with Mary to return in three years for her.

The three years pass, with no letters at all from Michael toward the end of them. Lionel Occleve goes out to Argentina with a pedigree bull-calf and hunts up Michael. He finds him living with a dark-eyed Spanish beauty,

> Whose great eyes burned,
> So that he could not choose but follow when she turned.

Michael would not come back because, as he says, Shropshire stifles him.

> I need the range,
> Like this before us, open to the sky;
> There every wing is clipped, but here a man can fly.

Lionel returns to England, telling Mary what he must tell her, but with no disloyalty to Michael. After a while he renews his suit, but Mary will not have him, and it is only upon his declaration that he will himself go over seas that she consents to become his wife. She cannot spare the taunt of sending a paper with the news of her marriage out to Michael. That brings him back. When she meets him his old domination of her is reasserted, and she goes off with him, first telling her husband that she will go. Already she had realized that she did wrong in marrying a man that she did not love, so it was easy for Michael to get her to leave "The Roughs."

It is a great shame to the Occleves, especially to the old folks, who cannot understand why Lionel lets her go, but he, of course, has understood her aversion to him, so he feels that he cannot hold her against her lovers' pleading. Mary and Michael settle down not far away. There are, of course, meetings between Michael and Lionel, and one fight in which Michael is knocked down in the muck of an inn-yard. The end of all comes when Michael visits "The Roughs" one day when the daffodils are in bloom. Lionel is cutting brush with a brush hook. The sight of his rival, insolent in his beauty, sets him mad. He tosses the brush hook to Michael, and himself seizing a stake, they fall to blows, despite Michael's attempt to tell him that he has come in peace. Michael is brought low by a stroke on the head, and in falling catches the brush hook in Lionel and mortally wounds him. Lionel asks Michael for water, and Michael crawls with it to him, to be stabbed by a knife that Lionel has concealed. When Mary comes Michael is dead and Lionel is dying. Lionel's last moments are lived to the hearing of Mary's lament over Michael. The two dead men are brought to "The Roughs"

farm, to which Mary all night long carries all the flowers of the spring to deck her lover. Her task done, she dies with the coming of the dawn.

If there is any quarrel with the reality of such a story it is in the character of Mary. We can readily understand how she was forced into marriage with Lionel. If she had not married him she had no one to turn to, no friend left in the world, as her father was dead and her home broken up. Her turning from Lionel is harder to believe in unless we regard her as a woman of the same fibre as Sue in Mr. Hardy's "Jude the Obscure." The average farm girl, situated as Mary is situated, would have had the loyalty to cleave to the man who stood by her through thick and thin unless it happened that he was physically very repulsive to her. There is no hint of this at all save that she tells Michael after the marriage that she had not understood what marriage meant. It is a little hard to believe, however, that one raised so close to the soil as Mary would not have known what marriage meant. If we can admit that, it is natural that she should go with Michael. It is still harder to understand why she had made up her mind to return to Lionel, a decision of her and her lover that Michael was trying to tell to Lionel when Lionel attacked him. Of course, again we can say there was nothing else for her to do because Michael had felt the old unrest and was leaving her again. Michael was "he who loves and rides away," and maybe it took the experience of living with him for Mary to find this out and to turn to the steady man, Lionel. In other words, we have to admit that she was the exceptional woman to make the story possible, but it is possible to accept that she is the unusual woman just as it is possible to accept that Sue Bridehead is—not that I mean that Mary Keir was in any sense the neurasthenic that Sue Bridehead was.

If you are willing to grant Mr. Masefield the possibility of his story, it seems to me that you must find little of offense in it.

In "The Daffodil Fields" I have so many passages marked to quote that I do not know which to choose. The poem seems to me, as a whole, to be the finest of his narratives, though it may

not at any one moment kindle to such fires as flare here and there in "The Widow in the Bye Street" or "The Everlasting Mercy." It has greater dignity than either, or than "Dauber," perhaps because of its slower, graver measure and the restraint imposed by the stanzaic structure, and the grip of the rhyme scheme. Never, too, has Mr. Masefield firmer power of characterization than here in "The Daffodil Fields," driving home all of a person, appearance, personality, temperament, character, in a line.

Thus he limns for you his heroine:

> The wind had brought the blood into her cheek,
> Heightening her beauty, but her great gray eyes
> Were troubled with a fear she could not speak.
> Firm, scarlet lips she had, not made for lies,
> Gentle she seemed, pure-natured, thoughtful, wise,
> And when she asked what turn the sickness took,
> Her voice's passing pureness on a low note shook.

And thus he read life, through the lips of Lionel Occleve:

> You are beautiful, [he thought]; and life is this:
> Walking a windy night while men are dying,
> To cry for one to come, and none to heed our crying.

And thus he describes the look of earth:

> So the night passed; the noisy wind went down;
> The half-burnt moon her starry trackway rode.
> Then the first fire was lighted in the town,
> And the first carter stacked his early load.
> Upon the farm's drawn blinds the morning glowed;
> And down the valley, with little clucks and trills,
> The dancing waters danced by dancing daffodils.

That was a picture of England; this I now read is a picture of the skies at night above the Pampas by the Platte:

> Something august was quick in all that sky,
> Wheeling in multitudinous march with fire;
> The falling of the wind brought it more nigh;
> They felt the earth take solace and respire;
> The horses shifted foothold in the mire,
> Splashing and making eddies.

And thus Mr. Masefield sings the vagrant heart, that was his own heart, that is the heart of his Michael Gray, tired now of Shropshire ways:

> And I have had enough of them; and now
> I make an end of them. I want to go
> Somewhere where man has never used a plough,
> Nor ever read a book; where clean winds blow,
> And passionate blood is not its owner's foe,
> And land is for the asking for it. There
> Man can create a life and have the open air.

And thus the content that came to the vagrant heart in the wild:

> Ceasing, in time, to write, ceasing to think,
> But happy in the wild life to the bone;
> The riding in vast space, the songs, the drink,
> Some careless heart beside him like his own,
> The racing and the fights, the ease unknown
> In older, soberer lands; his young blood thrilled.
> The pampas seemed his own, his cup of joy was filled.

So closely akin to "The Widow in the Bye Street" and "The Daffodil Fields" is "Nan" that, though it is in prose and they in verse, though it is a play and they are stories, it seems to me it is with them I should speak of "Nan." "Nan" is, indeed, as I said at the outset, thrilled with poetry; it is of low life, and it is tragic. Save that it has a certain quality derived, I think, from Mr. Masefields' listening to Synge and reading of Synge, "Nan" is of an inspiration and quality very like the two love tragedies in verse.

I have read very many English plays of today and yesterday and day before yesterday, and for many years I have sat out many more, but there is no English play written in prose, of those written within the past hundred years that I have read or seen or listened to, other than those of Synge, which moves me so much as "Nan." It is largely for its poetry, of course, that I admire "Nan," but I admire it, too, for its faithfulness to life and for that peculiar emotional appeal, the quality of which is

so difficult to describe, but which we call now ominous, now portentous, and now tragic. In owning my admiration for "Nan," however, I must own, too, that the fact that Mr. Masefield has published only three other plays and translated one other (from the Dutch) seems to show that his native genius is for verse rather than for prose drama. "Nan" is of a kind in subject and method of character presentation, with "The Campden Wonder" and "Mrs. Harrison;" but it is not of a quality like theirs; and "The Tragedy of Pompey" differs in both material and quality from "Nan."

"Nan" tells a story ordinary enough, that of the driving to murder and suicide of a peasant girl through the cruelty of her uncle's family. Nan's father has been hanged for sheep stealing, and she is taken as a sort of charity girl into the house of her mother's brother. Here her uncle's wife, Mrs. Pargetter, uses her as despitefully as her husband will allow, and when she finds out that Nan is displacing her own daughter, Jennie, in the affections of Dick Gurvil—a village swain of no particular charm or property, but after all Jennie's only chance—her despitefulness turns to fury. She manages to win Dick away from Nan just after Dick has owned his love for her. Then on the coming of the king's officers to pay Nan blood money for her father's death, it having been discovered by another man's confession that he, and not Nan's father, stole the sheep for whose stealing Nan's father was hanged, Dick tries to swing back again to Nan. Goaded to desperation by her lover's faithlessness and her aunt's bitterness, Nan loses control of herself and stabs her lover to the heart and rushes out to throw herself into the incoming tide on Severn Strath.

There are not many lines given to Nan in the play, but such is Mr. Masefield's power of character drawing that she stands before you as clearly as a Tess or a Rhoda Fleming. You are strangely worked up at thought of her desperate straits. You feel as you felt in reading "Tess," when you wanted to write to Mr. Hardy to save Tess from a return to Alec. You feel that you can hardly keep from interfering. You are reduced to so

elemental a state of mind that you become very like a man at a melodrama who insists upon climbing on the stage to save the heroine from the villain. In other words, you forget utterly that it is a story you are reading. It seems rather a bit of life that you are witnessing.

We have it on the authority of several men who have interviewed Mr. Masefield that he is writing other plays, plays to be performed on a stage projected out among the audience after the fashion of the Elizabethan stage. What these plays will be no one can predict, but from the love of Mr. Masefield for the poetic drama one wonders if they will not be plays in verse done somewhat in the fashion of his tales in verse.

That there is in Mr. Masefield a predilection for the unhappy ending is as true as that there is the obvious predilection for an unhappy ending in Mr. Hardy; but, as I said before, the general tone of Mr. Masefield is not so gloomy as Mr. Hardy's because he has not thought out a philosophical basis for his pessimism. Then, too, Mr. Masefield has children, and he can look forward to happiness for them, even if in his own experience of life he cannot feel that the sum total of happiness is greater than the sum total of unhappiness. There is, however, a gusto in living in Mr. Masefield that pervades all that he writes; indeed, there is a gusto even in his presentation of unhappiness. In "The Campden Wonder," for instance, he seems to really revel in piling horror upon horror upon us. It is reported, indeed, that at a performance of this play Mr. Masefield was delighted that people were so impressed by its horrors that they became actively sick. I have spoken of the verses of Mr. Masefield that have to do with the sea and with wayfaring and with love. I would now speak of those that give his reading of life, his philosophy, his beliefs. First among these verses, since I have been speaking just now of a novel in verse and a play, let me speak of that tale of his that has most in it of his reading of life—I mean "The Everlasting Mercy." This poem is not of the proportions or of the complexity of a novel but is rather a form in verse analogous to the short story in prose.

"The Everlasting Mercy" tells the story of one Saul Kane and of the means by which he was brought to grace. At the opening of the poem he was a wild youth of six and twenty. He had been his "folk's contrary son" until he was ten, and from ten to twenty had "cut his teeth and took to fun." From twenty to twenty-six he had lived "in disbelief of heaven." One day of his twenty-sixth year he was caught by a fellow-poacher, Billy Myers, setting a snare on what was by allotment of the poachers, Myer's territory to poach on. Kane refused to remove his wire, although he knew he was wrong, and it was agreed they should fight it out. They meet on Woodtop Field, a height above the town, where "the peewits go, mewing and wheeling ever so." Saul was being beaten by Billy when Billy crocked his thumb. This accident enabled Saul, whose heart had not been in the fight because he knew he was wrong in having poached on Billy's preserves, to knock Billy out. There follows the orgy at the tavern in the town, and the going mad with drink of Saul. He finally rushes out of the tavern, strips off his clothes and runs amuck through the town. He sets the fire-bells clanging, and then goes beating at the doors of houses in the village with the nozzle of a fire-hose, shouting. He gets away uncaught, and back to the inn by dawn. He falls asleep for a while, and then goes out to "do" the town again. He meets the parson, and has the worst of an economic argument with him, for "The trained mind outs the upright soul." He recovers somewhat from his debauch and lingers by a little brook, waiting for Jane, the barmaid, who has promised to meet him.

> The moon come pale, the wind come cool,
> A big pike leapt in Lower Pool,
> The peacock screamed, the clouds were straking,
> My cut cheek felt the weather breaking;
> An orange sunset waned and thinned
> Foretelling rain and western wind,
> And while I watched I heard distinct
> The metals on the railway clinked.

> The blood-edged clouds were all in tatters,
> The sky and earth seemed mad as hatters;
> They had a death look, wild and odd,
> Of something dark foretold by God.

On his way back to the tavern he befriends a little boy whose mother has left him on the curb, and he is attacked by the mother for befriending the child. The mother calls Saul "The town's disgrace, With God's commandments broke in's face." That was a real blow to Saul, for he loved children, "But this old mother made me," he says, "see the harm I done by being me." He tries to drown his troubles again by drinking that night in the tavern, but Miss Bourne, the Friend who went around each night at ten "to bring the drunkards' soul to grace," so wrought on him by her words when he insulted her that when he was turned out of the tavern at closing time "something broke inside his brain," and he had conviction of sin. The end of it all is that he goes out and hires himself to old Callow, the farmer, as ploughman, a changed man, let us hope.

Fellows to such a story are far to seek in contemporary literature, but there are at least "Jump to Glory Jane" of George Meredith and the getting of religion of Margaret Knox in "Fanny's First Play" to give "The Everlasting Mercy" countenance. If Mr. Masefield really need justification for such a treatment of such a subject other than the triumphant achievement of the poem, you can find that justification in high places. It is Coleridge who tells us that "No sound is dissonant which tells of life," and Browning who owned "No thought that ever stirred the human heart should be untold."

Do not misunderstand me. I do not hold "The Everlasting Mercy" without fault. But when I have fault to find with Mr. Masefield, in this poem as in other of his narrative poems, it is seldom fault with the architectonics of the poem; it is generally the workmanship in matters of detail that I find in fault. At times in his effort at faithful realism he not only eschews poetry entirely, but he leaves his lines, one cannot help feeling, as they first came to him, believing that any further considera-

tion of them would result in a finish too fine for the poem. If such was his motive for a roughness here and there it is hardly well taken, for at the close of these poems and elsewhere now and again he writes in the diction that English poetry has had from Milton's day to our own. Wordsworth had this same difficulty in being faithful to rustic speech when his emotion lifted greatly. In "The Ode on Immortality" and in "The Ode to Duty," and in "Tintern Abbey" he could not express himself save in the old and accredited poetic diction. And when Mr. Masefield is noblest he is writing in the grand old way of English poetry.

These narrative poems of Mr. Masefield differ in their appeal. All are strong, virile, elementary, coarse, as are the peasants and yeoman with whom the poems are concerned. The poems are vulgar, if you like, but in the old sense of the word vulgar, in its etymological sense, that is, of the people. Both "The Daffodil Fields" and "Dauber" are written throughout in exalted mood, while exaltation comes into "The Everlasting Mercy" and "The Widow in the Bye Street" only at moments, that is, only at moments until toward the end, when in each poem there is a strong uplift which is sustained to the close. "The Everlasting Mercy" and "The Widow in the Bye Street" are concerned with rougher folk, too, than the later poems; "The Everlasting Mercy" is supposed to be told in the hero's own words; and "The Widow in the Bye Street" largely in such words as the characters would use. There is less "lyrical interbreathing" in the earlier poems, less of the nature of the poet; "The Everlasting Mercy" and "The Widow in the Bye Street" are more objective, more dramatic—I mean dramatic in the sense of truth to point of view and quality of speech of the characters—than are "The Daffodil Fields" and "Dauber."

"Dauber" is to me the most poignant of all the four. The poacher hero of "The Everlasting Mercy" had, after all, known joy of a kind, Jim in "The Widow in the Bye Street" had his day's hope of love returned, and his old mother had bodily comfort after years of fasting and privation, and her joy in her son,

and the two of them the joy of singing "Binger" in the evening. In "The Daffodil Fields" all three had had joy, Michael most of it, Mary for a space the joy of love returned before she knew the pain of love forgotten; and even Lionel the joy of momentary possession. But poor Dauber had only the joy of dreams. There is joy in dreams truly, a great joy, but he had little of the great common joys. He had not even the joy of strength to offset somewhat the pain his sensitiveness brought him every day among the rough ways of his life on the farm and the nagging of father and sister; and his going to sea that seemed an escape was only a falling into the hands of persecutors whose pastime it became to taunt and bait him.

The very boldness of these tales in verse takes us, their realism, their out-spokenness, as do the different realism and different out-spokenness of Mr. Kipling. Yet as we re-read "The Rhyme of the Mary Gloucester" and "The Ballad of Fisher's Boarding House," the one still greatly contents us, but the other seems hard and worn. So it may perhaps be with "The Everlasting Mercy" and "The Widow in the Bye Street." I care more with every re-reading—I cannot pretend to say how many these re-readings are—I care more with each re-reading for "The Everlasting Mercy" and now less and now more for "The Widow in the Bye Street." The story of the latter is as universal as the story of Cain and Abel. I never read it with any lessening of the mere story's appeal, but its style and diction do not retain for me in certain parts of the poem the charm they once had. But the two later poems retain for me, after many re-readings, all the thrust they had on first reading, and I see on each return to them beauty and wisdom I had not seen before.

When one thinks of the novels of George Meredith, one thinks at once of the optimism of their writer; when one thinks of the novels of Mr. Hardy, one thinks at once of the pessimism of their writer. When one thinks of the poetry of Mr. A. E. Housman, one thinks at once of its depression; when one thinks of the poetry of Mr. Kipling, one thinks at once of its high-

heartedness. When one thinks of the verse of Mr. Masefield, it is not of its cheerfulness or sadness one thinks at all, but of its absolute realism. When one comes to know every line of his and to think over one poem along with another until the burden of thought and reading of life of all are fused in the memory, one realizes that there is more of sadness than of gladness in his record of life. Such a conclusion is the result of thought on the part of any one of us—there is, of course, in the aggregate, quantitatively more unpleasantness than pleasantness in the life of the average man. But thanks to a beneficent Providence, we always forget the unpleasantness in a comparatively short time, while those moments of pleasantness that have been ours come back again and again into memory and obscure by such continual recurrence the greater number of unpleasant days.

No one can say that Mr. Masefield's reading of life is a happy one, yet he is not the determined pessimist that Mr. Hardy is. Local conditions in the countryside that each was familiar with in boyhood are quite similar, though there is still more agricultural prosperity in Mr. Hardy's Central Wessex than in Mr. Masefield's west country. The Welsh Marches have been fought over again and again down the centuries, and, as Mr. A. E. Housman has told us, those old wars have left their impress on the temperament and outlook upon life of the people of Shropshire and Hereford, Worcester and Gloucester. Agriculture is none too prosperous in these districts, as indeed it is except in some special crops in few places in England, and the tendency here as elsewhere is for the best young blood of the country to be drawn into the towns. There are mills, coal pits and forges, in the Welsh Marches, but after all the English side of the marches is farm country, with, as I said, hardly enough hope in it to hold the young people at home. There is every justification in the surroundings then, for Mr. Masefield's stark and brutal tales. These surroundings today are not, indeed, in essential things, very different from those of the old days in which the story told in the ballad of Lambkin was lived, or from those of the still older days when among a kindred

people in Iceland arose the tales of Origines Islandicæ. The only wonder is that conditions in his west country have not driven him to a pessimism such as Mr. Housman's or Mr. Hardy's. That no conditions can so color his reading of life is, I think, because of that willingness of his in his years at sea and in knocking about as a sailor on tramp ashore to accept whatever is, and not to question at the moment of living this or that or to ask whether it is right or wrong. Listen to the ringing stoicism of this:

Laugh and be merry, remember, better the world with a song,
Better the world with a blow in the teeth of a wrong.
Laugh, for the time is brief, a thread the length of a span.
Laugh and be proud to belong to the old proud pageant of man.

Laugh and be merry: remember, in olden time,
God made Heaven and Earth for joy He took in a rhyme,
Made them, and filled them full with the strong red wine of His mirth.
The splendid joy of the stars: the joy of the earth.

So we must laugh and drink from the deep blue cup of the sky,
Join the jubilant song of the great stars sweeping by,
Laugh, and battle, and work, and drink of the wine outpoured
In the dear green earth, the sign of the joy of the Lord.

Laugh and be merry together, like brothers akin,
Guesting awhile in the rooms of a beautiful inn,
Glad till the dancing stops, and the lilt of the music ends,
Laugh till the game is played; and be you merry, my friends.

Reduced to bald prose, the burden of this lyric is that the best thing in life is living, without regard to the weighing of happiness and unhappiness in that living. As I said above, the narrative poems of Mr. Masefield are, in the main, records of unhappiness, but they are not written out of any such deeply-felt pessimism as are Mr. Hardy's poems and stories. Mr. Masefield never leaves you with the feeling that life is not worth the living, as Mr. Hardy so often does. There is such a vigor, such a freshness of feeling and such a joy in all the beauty of the world in Mr. Masefield's writing that, however sad the burden

of that writing, it never leaves you with a sense of defeat, but only, even at its saddest, chastened and pondering. Sometimes, in fact, it leaves you exalted, with the thought of how bravely men meet fate. In such mood "Dauber" leaves me always, and "The Widow in the Bye Street" oftentimes. As you lay down "Dauber" you say to yourself always, "The pity of it." As you lay down "The Widow in the Bye Street" you say after this reading, "The pity of it," and after that reading, "The irony of it;" and when you say "The irony of it" you are not too high of heart. But if there is irony in the circumstances of "The Widow in the Bye Street" there is no irony in the spirit of the poet as he writes. This absence of irony in Mr. Masefield is what most definitely differentiates his writing from that of Mr. Hardy, Mr. Hardy, the greatest ironist of our time. And as Mr. Masefield is without irony so, too, is he without propaganda. He is content, as were his predecessors in realistic narrative verse, Crabbe and Wordsworth, Tennyson and T. E. Brown, to picture things as they are. There is no doubt where Mr. Masefield stands—he is on the side of the angels—but he is content to stop when he has put the thing as he sees it. And this characteristic of his makes surely for refreshment of spirit in a day of such troubled and troubling writers as Mr. Hardy and Mr. Galsworthy, and such agitators as Mr. Shaw and Mr. Wells.

It is not pleasant, some may say, this life that Mr. Masefield presents. Frankly, in many of his poems the life presented is not pleasant. But pleasantness, surely, is not a basic quality of great things. Do we ask, had such a one a pleasant life? Never, in my experience. We do ask, of course, had he a happy life? A happy life doesn't mean a pleasant life. A man may have found the ways of the world easy to him, pleasantness about him, but no happiness. Happiness is found oftener on the rough ways than the smooth. Happiness has its roots not in one thing only but in many things. It comes from health of body and of mind; from disposition; from temperament; from satisfaction in duties done; from accomplishment through

powers tried and found not wanting; above all, from a sense that the best thing in life is living.

Nor is happiness itself a necessary quality of great things. How many of the great stories of the world have been happy stories? What are the great stories in the world? If they are the story of Paris and Helen, of Sigurd and Brunhilde, of Tristram and Iseult, of Romeo and Juliet, of Faust and Marguerite, of Richard Feverel and Lucy Desborough, then the great stories of the world are not stories of happiness. Yet acceptant of things as they are as Mr. Masefield is in the main, there are those who object to his reading of life. That is to be expected. Mr. Hardy never wrote truer words than those he recorded in Gibbon's old garden at Lausanne:

> Still rule those minds on earth
> At whom sage Milton's wormwood words are hurled:
> "Truth like a bastard comes into the world
> Never without ill-fame to him who gives her birth."

It is easier to understand the objections of those who say the common speech of his yokels dispels poetry from the verses in which they live and move and speak. Perhaps sometimes it does, but let us remember a like criticism was brought against Wordsworth and Whitman, and Henley and Mr. Kipling, and that many of the verses so attacked are now among those most cherished by lovers of poetry. Certainly no one can cavil at the diction of the lyrics of Mr. Masefield, which is the right authentic speech of English poetry. In the narrative poems the speech is of many sorts. It is now austere, this speech, now rough, but it can soften, when the right time comes, as winter softens into spring. It is indeed to this time of the year that the verses of Mr. Masefield are attuned, the close of March, a season when one hour is of sun overcast and roaring wind that baffles the northing birds, and the next of sunlight and soft calm that thrills them to glad cries from the tree-tops. Yes, Mr. Masefield is spring, early spring in a hill country, March in Shropshire. There is still an austerity as of winter in the air, and the trees

stand leafless, now bending to winds that make loud the valleys, now resting all of them, great branch to highest twig, motionless against the utter blue of the sky. Some men find little beauty in such days. The roads are muddy, the streams roily and the air keen. Yet there are those of us who go stout-shod and who are sound of limb and heart, and such the country road will lead by green pastures even at this time of the year. And if the streams are roily they run with a "glad noise;" and if the air is keen it kindles the blood.

I have wished so to speak today that you, if there are any such, that have not read Mr. Masefield will be led to read him. I have praised, and praised highly, but this praise, I hope, is not immoderate. Remember, I am two and forty, when new enthusiasms are rare. I have known the writing of Mr. Masefield for twelve years now, but a part of it that has moved me greatly, with the rest of the world that reads poetry, was written within the past two years. My enthusiam would be great, but not so great as it is, without "The Everlasting Mercy" and "The Widow in the Bye Street," without "Dauber" and "The Daffodil Fields."

I have praised this poetry and the play of "Nan" because I hold them noble. When you know something noble, it is your duty, I take it, as it is your privilege, to give praise. There are weaknesses in this work—I have mentioned some of them—but I have spoken less of these weaknesses than of the strength and beauty, for it is by a man's best that he stands or falls. A Wordsworth or a Tennyson, a Masefield, has, maybe, three-fourths of his writing forgotten, but what there is valuable in that writing may not be forgotten. It is, of course, little short of folly to attempt prophecy of a writer's future, and this folly, at least, I shall avoid. I would point out, however, that the verse of Mr. Masefield has lyrical cry and natural magic, large accent, and—when its maker will—grand style. These are attributes of great poetry. There are lines of his that you may not forget, like that great line of "The Widow in the Bye Street," "Newness in lust, always the old in love." There are lyrics of

his like "Sea Fever" which, when they have once sung themselves into your memory, may not fade out of it. It were well could you say as much of many poets. In the end time will judge Mr. Masefield, as it judges all; meanwhile it seems to me great good fortune that we have him to praise.

RACE-MAKING PROCESS IN THE UNITED STATES

By J. P. Lichtenberger
Professor of Sociology, University of Pennsylvania

Ever since the day when an Italian navigator fitted out a Spanish expedition on a Jewish loan and discovered a new continent for the English, the race-making process in the New World has been increasingly important.

The purpose of this lecture is merely to analyze this process and not to advocate any scheme to facilitate or retard it. The process itself is not new. It is a world phenomenon. From the cradle of the race, wherever that may have been, mankind spread gradually over wide areas of the earth's surface. As different latitudes and diverse environments were encountered, a process of differentiation resulted. Variation and selection created types differing by slight degrees at first, but gradually these became more distinct and fixed as the equilibrium between different groups and their environment became established. While these racial differences have not become great enough to divide mankind, as they have in all other animals, into distinct species, they still are large enough to have given rise to the theory, now generally discredited, of the polygenetic origin of man, as championed by Gumplowicz in his Der Rossenkampf and by other writers. For the details of this age-long process we must depend upon the investigations of the paleontologist, the archeologist, the ethnologist.

The brief period which we designate as the historic, merely because human achievement has been committed to record, witnesses the later stages of the integration process. Because of increase in numbers and the pressure of population upon food supply, conflict over desirable territory resulted, with consequent conquest and subjugation.

The nation-making process, therefore, is one of fusion and

amalgamation of diverse ethnic stocks through warlike struggle or peaceful assimilation. So far as we know there are no exceptions to this rule among the great nations ancient or modern.

Egypt, the Nile Valley, was a melting pot into which was poured Libyans of the north and west, East Africans—the Galla, Samoli, etc.—Hamitic peoples from Arabia and Semites from the East coast. Amalgamation produced the Egyptian race. The invasion of the Delta by the Semitic tribes from Palestine is but one of scores, perhaps, of similar migrations.

Libyans, Pelasgians, Etruscans, Iberians, Picts, various branches of the Mediterranean race, formed the basic strata of population in Greece, Rome, Spain, England and many other countries.

The modern Greek of the Homeric period with his blond mixture was the product of the ancient race which founded the Minoan civilization of Crete and built the ancient cities of Mycene, Argos and Troy, crossed by the blue-eyed, fair-haired Danubian peoples of the north.

The race-making process in England has been exhibited within the historic period in great minuteness of detail.

One of the first authentic accounts of the population of the British Isles is given in the writings of Cæsar. He describes them as follows:

"Who were the first inhabitants of Britain, whether indigenous or immigrant, is a question involved in the obscurity usual among barbarians. Their temperament of body is various, whence deductions are formed of their different origin. Thus, the ruddy hair and large limbs of the Caledonians point out a German derivation. The swarthy complexion and curled hair of the Silures, together with their situation opposite to Spain, render it probable that a colony of the ancient Iberians possessed themselves of that territory. They who are nearest Gaul resemble the inhabitants of that country; whether from the duration of hereditary influence, or whether it be that when lands jut forward and in opposite directions

climate gives the same condition of body to the inhabitants of both. On a general survey, however, it appears probable that the Gauls originally took possession of the neighboring coast."

To these three elements, which are clearly Teutonic, Celtic and Iberic, there were added by a succession of invasions, Angles, Saxons, Jutes and Danes, all of whom were of Teutonic extraction. To this mixture was added further in the Norman conquest, a group of people who were of Teutonic and Celtic mixture. Through the process of amalgamation it required but a few centuries to create out of these diverse elements a new race, namely, the English. Here we have illustrated within the range of comparatively modern history the process which evidently has been characteristic of the formation of all great peoples.

With this general process of race-making in mind, we turn directly to the task of studying the process as it is exhibited in the New World. At the outset we are confronted by a situation which differs radically from that which is usually exhibited in the general process. American civilization is European civilization transplanted to American soil. The American aborigines, instead of being conquered, overspread and amalgamated into a new race, were pushed back and for several centuries have constituted a separate people with whom very little intermixture has taken place. We begin, therefore, with the process as it is exhibited in the amalgamation of European elements contributed through the period of colonization.

The race-making process in the United States presents three well-defined epochs; namely, the Colonial period, ranging from the discovery of America by Europeans, approximately to 1750; second, the period of natural increase, from 1750 to 1820; third, the period of immigration, from 1820 to the present time. The Colonial period was characterized by the coming of diverse European elements. The French settled chiefly in the north in the region of the St. Lawrence and the Great Lakes. The Spanish established their colonies in the south, particularly in Florida and the Gulf region. The Dutch

settled in the Hudson Valley. Germans were distributed along the coast in a number of colonies, but chiefly in the region of Pennsylvania. The Swedes occupied the territory along the Delaware. Jewish settlements were made in South Carolina and Georgia. Others were distributed as merchants through many of the other colonies. French Huguenots settled in the Carolinas and Virginia. The English occupied settlements along the coast from Maine to Virginia and constituted the most numerous element.

Historical developments by which the English came into possession of the entire country lie outside the purpose and scope of this discussion. While the Colonial period ends with the Revolution, colonization as such terminated approximately by 1750. The significant fact for our discussion presented in this Colonial period is the diverse racial element that comprises the American population. The period 1750 to 1820 is described by many writers as the period of racial amalgamation, in which these various racial elements were being combined into a new American race, and we were in the process of creating a people not essentially different in ethnic stock from that of the great English race. This, it may be noted, was the period of our most rapid increase of population. Comparatively few people were arriving from Europe and if no further additions to our population had been made from foreign sources our American population by this time would have presented a fair degree of homogeneity. By 1820, however, it was apparent that this natural growth through intermarriage and large families was being supplemented by the presence of aliens who were coming not as colonists but as individuals filtering in and mingling with the resident population. This process of infiltering of individuals from the various peoples of Europe we designate immigration.

It will now be necessary to turn our attention for a moment to the general characteristics of this immigrant tide. Since 1820 it has been recognized and tabulated in our population statistics, and hence is available for study. From the earliest

date of record the tide of immigration has increased in a steady, though irregular, progression from approximately 8,000 to 1,000,000. The high tide years are 1854, 1873, 1882, 1892 and 1907. In the earlier years of this stream of immigration the racial elements were chiefly from those countries which had contributed to the population in the Colonial period, prominently from the north and west of Europe. About the year 1870, however, this tide began to be complicated racially by arrivals, in increasing numbers, from southern and eastern European countries, thus adding a new element to the racial character of the American population. The year 1896 shows these two general types, namely, the northern and western European and the southern and eastern European, to have been approximately equal. Since 1896 the elements have been reversed and whereas approximately 85 per cent, up to 1882, had been of northern and western European origin, since 1900 85 per cent has been southern and eastern European.

But before considering the influence of this change in racial elements upon the character of the American population, it may be well to study briefly the volume of immigration in relation to the total population. It has been assumed by many that the tide of immigration threatens radically to change our racial character because of its overwhelming volume. Recourse to the census figures reveals the interesting fact that the foreign-born portion of the population remains relatively constant. The figures for the decades 1860 to 1910 show the following percentages of foreign born:

1910..... 14.7	1890..... 14.7	1870..... 14.4
1900..... 13.6	1880..... 13.3	1860..... 13.2

It will be observed that the foreign-born portion of our population is precisely the same in 1910 as it was in 1890 and 0.3 per cent greater than in 1870. It is not apparent, therefore, that our foreign-born element is larger in proportion to the native population than it was in our earlier decades and that our chief source of increase has not been due to the influx of

foreigners. The aggregate population has grown from approximately 9,000,000 in 1820 to more than 91,000,000 in 1910, while our foreign-born population has grown from less than 1,000,000 to 13,500,000. Or more concretely, while our foreign-born population increased 3,164,610 from 1900 to 1910, the entire population increased 15,977,691. If these figures do not seem to correspond with the immigration figures for the period 1900 to 1910 the explanation is to be found in the fact that the figures of immigration usually contain merely the report of those entering the United States without reference to those who return.

The actual net increase in immigration after deducting those who return from those who arrive for the period 1908 to 1913 is as follows:

1913	815,863	
1912	401,863	
1911	512,085	or an average of 550,130
1910	817,619	for the six years.
1909	543,843	
1908	209,868	

It will be observed, therefore, that the racial modification of our population through immigration is very much less than is usually supposed. For the year 1913 the net addition through immigration was one alien for every 121 persons in the resident population.

Turning now to the problem of assimilation, it may be well to consider first the two elements conspicuously omitted from our discussion thus far: the Indian and the Negro. The American Indians, pushed back for years by the advancing frontier of European civilization in America, have been completely surrounded by the white population and enclosed in reservations. It is now the fixed policy of the government completely to absorb socially, politically and racially this primitive people. But since they numbered but 265,683 in 1910, or but 0.3 per cent, their absorption cannot affect materially the character of the population and we pass them without further consideration.

The Negro presents a more important element. There were in the United States in 1910, 9,827,763 persons of African descent. This group constituted 10.7 of the entire population, or precisely 4 per cent less than the foreign born. This difference, however, may be noted. While the percentage of the foreign born has remained relatively constant or even has slightly increased, that of the Negro has fallen constantly since 1790, when it composed more than 20 per cent. The Negro problem is relatively only half as large as it was at the time of our first census. That this diminishing ratio still persists is exhibited by the fact that while the white population increased from 1900 to 1910 at the rate of 22.3 per cent, the rate of Negro increase was 11.2 per cent, or approximately half that of the white.

While it is true that amalgamation of the white and colored races has been constant and rapid, as exhibited by the fact that from 25 to 40 per cent of the Negroes in the United States are mulatto or of a less degree of mixture, there is every indication that miscegenation is diminishing and a social and racial equilibrium is being established. Further crossing is now discouraged and discountenanced by both races.

This fact, taken together with the diminishing ratio of negroes to whites, enables us to regard the danger of amalgamation here with a relative degree of complacency.

It seems necessary in considering the problem of assimilation of our alien population to take a little broader view. While our task concerns itself primarily with racial absorption, this phase of the subject is complicated by other aspects of the same process to which some attention should be paid. The industrial assimilation of the immigrant appears to many persons to be of the greatest possible significance. It is assumed that the presence of large numbers of cheap European laborers imperils American standards of living and conditions of employment. This is no doubt true to some degree. This aspect of the problem was made the subject of special investigation by the Immigration Commission of 1907. The findings of this

commission throw considerable doubt upon the degree of positiveness with which many have claimed that American labor has been threatened. The commission reported that it was its opinion that a point of saturation has been reached, but that in its judgment there was no evidence that immigration had thus far resulted in an actual reduction of wages to American laborers, though it might have prevented wages from rising in certain industries. It furthermore reported as a result of specific investigations that the annual wage of the foreign-born laborers in the 26,616 households investigated amounted to $455 per annum; native born of foreign fathers, $566, whereas American-born laborers averaged $666 per annum, or $211 in excess of foreign and $100 in excess of native born of foreign fathers, all of which would seem to indicate that one of the chief results of immigration in the industrial field is to push American labor up rather than out.

As regards the matter of social assimilation, the increasing number of aliens pressing for naturalization, together with the rapidly diminishing degree of illiteracy, particularly among the children of the foreign born, would indicate a tendency toward social assimilation. For those who have not consulted the statistics of illiteracy, it may be of interest to know that the group showing the smallest degree of illiteracy in the United States is comprised of the children of aliens. While illiteracy for the total population of the United States is 7.7 per cent, that of the Negroes 30.7 per cent, of the foreign born 14 per cent, of the native born white of native parents 3.7 per cent, that of the native born of foreign parents is 1.1 per cent. While the low degree of illiteracy here is usually explained as due to the fact that foreigners are congested in cities where urban educational opportunities are afforded to their children, it is nevertheless true that our alien population in the second generation does not resist the opportunities of education which are afforded freely through our public school system. Whatever may be the difficulties involved because of illiteracy in the first generation, the problem is solved practically in the second.

On the problem of racial assimilation, little definite information is available. Throughout history, every evidence is available to show that the process of amalgamation, between different races occupying the same territory, is universal. We may assume, therefore, as a general sociological principle that rapid racial amalgamation between Europeans and native Americans will take place on a large scale. Evidence of this kind, though inadequate to describe the details of the process, is available.

In the census of 1910 we find that 7.3 per cent of the entire population of the United States is of mixed parentage. This has grown from 3.4 in 1870 to its present status. No figures are obtainable for the purpose of discovering how high the percentage is of the marriage of different racial elements in the second and third generations. If these figures were obtainable there is little doubt that they would show an extraordinarily high degree of racial intermixture. Specific inquiries made of any group of people will reveal the fact that in the ancestry of the average American there are from three to five and often a still larger number of racial elements represented.

But what of the significance of this racial amalgamation, and especially in view of the new elements from southern and eastern Europe? One sociological generalization which seems to stand unchallenged is that heterogeneous populations, because of the diversity of their racial elements, tend toward progressiveness, whereas homogeneous populations tend toward conservatism. "Mixed races, after natural selection has eliminated their weaklings, are taller, stronger, more prolific and more adaptable than pure races are. Crossing creates physiological plasticity and variability." It is entirely possible that too high a degree of heterogeneity would stand in the way of progress, but fortunately that high degree has not been reached in any of the western nations.

On general principles, therefore, we should conclude that race mixture in the United States may be regarded as a factor of continued progress. But it is objected that the large inter-

mixture of southern and eastern European races is destined to modify this progressiveness in an undesirable way. This is entirely possible, but before we arrive at this conclusion, a few observations should be made. First, scientists are agreed substantially that the differences in races, at least the races of the modern world, are not fundamentally biological in character but merely cultural. The differences between peoples are differences in what they know and what they have experienced rather than in what they are. In the second place, attention should be called to the fact that the Mediterranean races of which our new immigration is largely constituted have in the history of the past originated all the great civilizations of the world. Western nations have merely built upon and improved these structures. Third, it may be observed that the backwardness of the nations from which our new immigrants are coming is because of political, social and economic conditions rather than racial inability. Finally, it may be observed that the race-making process in the cases of Egypt, Greece, Rome, England and most other nations is merely being reversed as far as the chronology of component ethnic stocks is concerned. In all of these nations just referred to, the basic Mediterranean elements of population were overspread and amalgamated with the races from the north.

I have already indicated that in the formation of the population Teutonic elements predeterminated from the beginning until the period of rapid immigration. We are therefore witnessing the combination of the same racial elements with the difference that the Anglo-Saxon race is now being crossed by the Mediterranean groups. Whether or not the order of mixture is of consequence, perhaps time alone can determine.

Is it therefore possible, in view of the facts presented, that the crossing of the pushing, driving, progressive, domineering Anglo-Saxon with the artistic, culture-loving peoples of southern and eastern Europe may result in the finest racial type that the world has yet produced?

BERLIN AND THE MODERN GERMANY

By William E. Lingelbach

Professor of Modern European History, University of Pennsylvania

Berlin, the metroplis of the German Empire, is located on the little river Spree, which, with the aid of canals, unites the valley of the Oder with that of the Elbe. The city occupies the intersecting point of the commerce between the Elbe valley on the west and the Oder, Poland and Central Russia on the east; and the trade from the Baltic southward to Central Germany. Apart from this, the location of the city has little to commend it; the area surrounding it consists of a vast sandy plain, by nature unproductive and unfruitful, and here from a struggling little fishing village at a ford of the Spree, Berlin has slowly risen, first to be the chief town of the province of Brandenburg, then to be the capital of military-bureaucratic Prussia, and, since 1870, to be the metropolis of the German Empire, no longer provincial and agricultural, but industrial, commercial and cosmopolitan.

As the capital of a nation, it is therefore very young; the youngest, in fact, of the world's great capital cities. Just as the German Empire is the youngest of the great powers, being only little over forty-three years old. The origin and early history of the place are intimately associated with the expansive energy of the early Germans, for Berlin, like Vienna, was built by the Germans in the territory of the hostile Slav, an outpost, as it were, of an eastward expansion which later reached the confines of Russia. At the beginning of the fifteenth century the territories about Berlin were bestowed on the House of Hohenzollern, whose ancestral home lies in south Germany near the source of the Danube, a little north of Switzerland. Indeed, in 1915, it will be exactly 500 years that the Emperor's

ancestor came to Berlin, to an unpromising and hostile people, for he was given to understand on his arrival that "Were it to rain burgrafs the whole year, none would be allowed to grow in the marsh." But Frederick's money and his Nuremberg jewels, as the people called his cannon balls, conquered all opposition, and the Hohenzollerns established themselves firmly in the electorate of Brandenburg.

During the great conflicts over religion in the sixteenth century, the people of Brandenburg accepted Protestantism, to be followed in 1535 by their elector Joachim II. This had momentous consequences upon the reigning house, for all the power before wielded by the Church was now acquired by the ruler, and the increased prerogatives of the Prussian crown have ever since been a power to conjure with.

In the religious wars which followed the Protestant revolt, Brandenburg suffered terribly; Imperialists, Swedes, Danes, as well as her own troops crossed and recrossed her lands. The population of Berlin was reduced one-half; the Berliners actually talked of emigrating in a body. It required all the statesmanship of the Great Elector, who came to the throne in 1640, to redeem the fortunes of the much stricken land. With characteristic Hohenzollern energy, thrift and enterprise, he set about the task not only of making good the ravages of war, but of unifying and consolidating the newly acquired territories. For in 1608 Brandenburg had obtained through the inheritance of Julich and Cleves, her first foothold on the Rhine, and by the acquisition, in 1618, of East Prussia, she began her absorption of the southern shore of the Baltic. These outlying territories, as well as those acquired by the Peace of Westphalia in 1648, differed widely in laws and institutions from the old state of Brandenburg, and the Elector's greatest service to his state was the assimilation of these differences into a common system of government and administration. Enlightened and tolerant, the Great Elector invited to his country those persecuted for conscience sake of every land, both Protestant and Catholic. More than 20,000 French Huguenots settled

in Berlin alone after the fateful revocation of the Edict of Nantes, and in a generation converted the sandy waste about Charlottenburg into a veritable garden.

His successor did little to carry on the work of his father, but obtained for himself and his house the title of "King in Prussia," and in 1701 had himself crowned at Kōnigsberg. Thenceforward the name Prussia gradually displaces that of Brandenburg, notwithstanding the fact that Prussia was much the less valuable territory at the time, lying far to the east on the south shore of the Baltic.

At his death in 1713, there came to the throne the notorious Frederick William I, generally known to history as the father of Frederick the Great. Everyone is familiar with the vagaries of this eccentric boor, how he immediately dismissed most of the servants of the royal household, reduced everything to the most parsimonious basis possible, and began hoarding; how he kept his eye upon everybody and everything; how he would cane idlers on the street and order the ostentatious and the rich to build fine houses to improve the looks of Berlin; how his craze for tall soldiers—his Potsdam grenadiers—got him into constant difficulties, for his press gangs were on the lookout everywhere for tall men, and never hesitated to kidnap them if other means of persuasion failed. He exchanged with Peter the Great a batch of trained engineers for tall peasants, and at Dresden you may see today six fine Chinese vases called the grenadier vases because gotten in exchange for some tall Saxons. Unfortunately these eccentricities were extended to his domestic life, and on one occasion nearly cost the life of his son, the future Frederick the Great. Yet with all his shortcomings, Frederick William I was the best domestic ruler Prussia has had. To him she owes the organization of that Prussian bureaucracy which, in spite of its red tape and officialdom, is notable the world over for its efficiency and devotion to duty. She owes to him also the full treasury and the wonderful army which his iron discipline moulded into that perfect military engine so effectively used by his successor.

To Frederick the Great, who succeeded to the throne in 1740, fell the task of defending single-handed the position of Prussia as a state against a seemingly overwhelming coalition of Austria, France, Russia, Sweden and the states of the Empire. During the Seven Years' War, Prussia's heroic fight for existence was conducted by Frederick with astounding ability, resourcefulness and courage. Rushing like a wounded lion at bay, from one antagonist to the other, usually victorious, but growing steadily weaker from his very victories, Prussia's great king saw the iron circle of his enemies drawing closer and closer to the heart of his kingdom. Indeed, during his darkest hours, Berlin was captured and partially burned by the Russians. But peace came at last in 1763 without the loss of any territory, and from that time till his death her warrior king devoted himself to the rehabilitation of his country with as much energy as he had employed in defending her in battle.

Thirty years after the death of Frederick the Great came the years of great sorrow in Prussia. Prussia's overthrow by Napoleon at Jena in 1806 and the humiliation that followed is a familiar story. For over six years, from 1806 to 1813, French garrisons and French armies dominated the land, imposing humiliating terms of peace, dictating that Prussia reduce her army to 40,000 and pay an ever-increasing indemnity. Conspicuous among the sufferers of these dark days was Queen Louise, whose beauty and heroism did so much to arouse the indignation of the phlegmatic Prussians and keep alive the fires of patriotism. Indeed, her untimely death in 1810, from a broken heart, it was said, became one of the most powerful though silent forces in the great national uprising in 1813, and her tomb in the beautiful mausoleum by the sculptor Rauch is the Mecca of patriotic Germans today.

The wave of national enthusiasm and sacrifice which freed Germany from Napoleon deserved a better recognition than was accorded it at the Congress of Vienna which assembled in the late summer of 1815 to adjust the affairs of Europe. Patriotic Germans, particularly of the upper classes, men like

Stein and Hardenberg, hoped for a strong united nation. Five years before, during the darkest hour of Prussian history, they had succeeded in passing the great reform edict which at last put the social and economic order on a modern basis. But nothing so enlightened came from Vienna, on the political reorganization.

Instead of a modern united Germany with a strongly centralized government, a loose confederation under Austrian leadership was created. Each of the thirty-eight states was sovereign; that is, each state maintained its own army, levied its taxes, coined its money, etc. Mutually hostile tariff systems made trade and communication almost impossible. A merchant taking goods from Hamburg to Switzerland had to pass through ten states, ten custom's systems and calculate tariff charges in ten different monetary systems. To go from Fulda to Altenburg, a distance of 125 miles, the German of the nineteenth century passed thirty-four boundary lines and crossed nine sovereign states. Constitutional or representative government there was none, save in a few states; in the others, especially in Prussia and Austria, absolutism and reaction were restored.

For half a century, reaction and oppression prevailed, the people had little or no share in the government; the rights of the individual were trodden under foot; in all the states, arbitrary arrest and imprisonment became the order of the day, the press was gagged, trial by jury denied, patriotic and student societies suppressed and the universities muzzled. Little wonder that such reactionary tyranny called forth protests.

The spirit of nationalism and of liberalism gathering force, slowly at first, attained irresistible momentum in the great revolutionary movement of 1848. Even early in the forties, it had burst forth into brilliant though fitful flame. Excited by war talk in France, the Germans everywhere uttered defiance. The completion of the great Cathedral at Cologne gave rise to patriotic festivities of great fervor. Prussia's king made speeches on nationality and liberalism, he bestowed a pension

on the author of the "Der deutsche Rhein," which with "Deutschland Über Alles" and "Die Wacht am Rhein" was written at this time. It became at once the national song, and was only replaced in 1870 by the "Die Wacht am Rhein."

But the Germans had not yet been tried in the fire. The final test of the growing tide of liberalism found it unequal to the task of transforming Germany, of welding it into a united nation. The revolutions of 1848 found in Germany much inflammable material. For a short time the conflagration spread over the length and breadth of the land from Berlin to Vienna, from the Rheinish provinces to the frontiers of Poland. A representative parliament chosen by the people assembled at Frankfort. But like the Estates General in France in 1789, it lost itself in the discussion of abstract rights and principles, as this caricature in a contemporary paper will illustrate. In the meantime, throughout the various states the first ardor for revolution was waning and the princes gradually asserted themselves. The Frankfort parliament of 1848 broke up, the old diet was restored and reaction again triumphed; arrests, imprisonments and execution followed and widespread depression prevailed, adding increased volume and a new character to the great stream of emigration from Germany to America in the nineteenth century. The revolutions of 1848 and the depression that followed drew the intellectual class into the current of the "Auswanderung" men like Karl Schurz and his friends.

But a day of reckoning was at hand. Among the thirty-eight states of the Germanic Confederation, one had been slowly but irresistibly forging ahead. Prussia by virtue of her favored geographic position, her control of the rivers of Germany, by her size and by her wise commercial policy as seen in the Prussian Customs Union, was assuming an ascendancy in North Germany that was threatening Austrian ascendancy. Out of the rivalry and struggle for leadership, two great wars, and one lesser one were to afford the stepping stones toward German unification; Austria was first laid low in 1866 and expelled

from Germany. The turn of France came next, and in 1870 she too was crushed and defeated. Amid the victories of these wars the new Germany arose. On January 18, 1871, in the palace of the King of France at Versailles, while German cannon were still roaring against Paris, the German Empire was proclaimed to the world.

The architect was none other than Otto von Bismarck, who by his policy of iron and blood did what German liberalism had failed to do. He welded the German states into a compact and united empire. Of the other leaders in this great work, William I and Moltke stand shoulder to shoulder with Bismarck, the three supplementing each other in a remarkable manner. But when all has been said, it must be conceded that the form and figure of Bismarck stands out conspicuously before them all as the great master builder of the Teutonic world. "From the very beginning of my career, my sole guiding star has been to unite Germany, and that being achieved, so to strengthen, complete and consolidate her unification that it may be preserved enduringly, and with the good will of all concerned in it." However much we may censure many of his acts, the fact remains that to lead up to and bring about at just the right psychological moment, the long-yearned-for German unification is an achievement that stamps him as the greatest constructive statesman of the century.

The empire thus brought into being consists of twenty-five states bound together in a confederation to which the constitution gives the name "Empire." Each of these twenty-five states has its own government. Four are monarchies, many are duchies and three are republics. In size and population they vary quite as much, from little Anhalt with 45,000 inhabitants to Prussia with its 30,000,000.

Of the phenomena associated with the development of the empire since 1870, by far the most important is the growth of the German cities. Next to the great fact of German unification itself, no other single fact in European history will—it seems to me—stand out so conspicuously for the historian of the future

as the growth and development of urban communities. In 1870 Germany had eight towns with a population of over 100,000; in 1910, she had forty-seven, of which eleven had over 250,000 and five over 500,000, and the city of Berlin, if one includes the suburbs, between 3,000,000 and 4,000,000. Berlin and Hamburg have quadrupled their population since 1870, that of Leipzig is five times as great, while Düsseldorf has grown from 69,000 to 558,000.

In this Berlin is typical of the empire as a whole. Since 1870 the population of Germany has risen by leaps and bounds, despite the large emigration of the seventies and eighties, and today it numbers 67,000,000. Manifestly the Germans still exemplify the virtues ascribed to them with such Rooseveltian enthusiasm by Tacitus, who says, "They consider it a crime to set limits to population by rearing up only a certain number of children and destroying the rest." The annual increase in recent years approximates the round sum of 800,000. On the other hand, it should not be overlooked that in every recent years there has been a decided falling off in the number of births: from 24.63 per 1,000 in 1897 to 20.84 in 1911, *i. e.*, a decline of 1-6. But this is more than offset by the decrease in the death rate. Another characteristic of the movement of population is the fact that so much of the increase is found in the cities. Since 1880 the city population of Germany has increased over 14,000,000, almost equal to the total increase of population of the Empire as a whole.

With the growth of the cities and the new and complex problems of modern city life associated with it, there has been evolved what is probably the most efficient type of municipal government in the world. Indeed, so remarkable have been the results of German municipal government that many Americans believe that the surest cure for the evils that afflict our city life would be to copy the method and practice of the Kaiser's capital, especially in the matter of municipal ownership and the operation of public service utilities. The suggestion, though often made, seems to me quite wide of the mark. In the first

place, Berlin, as I hope to show, is far from having gone in completely for ownership and operation of her public service utilities. In the second place, the conditions of government and of population differ so much that it is hard to see how what succeeds admirably in Berlin would necessarily succeed in New York or Philadelphia. In America we have direct universal suffrage. This gives to every male citizen an equal share in the city government. Prussia—possibly to its disadvantage—does not have it. She does not have it, even though she has by comparison with the United States a homogeneous population; Prussia's political stomach is not troubled with the indigestion induced by the gulping, without any suggestion of Fletcherism, of hundreds of thousands of aliens, all of them excellent food for a great republic no doubt, but not quite properly seasoned for the palate or the ballot, especially when taken in such quantity.

But as I have just said, even with a homegeneous population, Berlin does not entrust the management of municipal affairs to the whole population, but to the best element only. Indeed, many claim that it is due to this, more than to any other cause, that she has secured her deservedly famed and efficient government. She searches out the best talent and delegates to it the complicated conduct of municipal business. The present mayor of Berlin, elected in 1912, is Wermuth, former secretary of the Imperial Treasury, one of the most important offices in the land.

But the organization and mode of government differs in important points so radically from ours that I must describe its salient points. The voters of Berlin elect a city council (Stadtverordnete Versammlung) of 144 deputies. To the council they hand over the government of the city, and hold it responsible. It appoints the mayor and an administrative body to assist him. If it makes a bad choice, if he is incompetent or refuses to carry out its policies, the council must assume the responsibility and find a way out. The mayor of Berlin is always an expert in municipal matters, and that he may become

more so he is engaged for a period of twelve years. Nor is he necessarily a citizen of Berlin. The Germans believe in the value of experts in municipal administration, and in order to secure the greatest efficiency, most German cities have no hesitation in getting their experts anywhere within the Empire. Associated with the mayor of Berlin is a vice-mayor and administrative board of thirty-four, eighteen of whom are paid good salaries to give the city the benefit of their technical knowledge and experience. They, as well as those not salaried, are always men of high standing in the community; indeed, the unpaid positions are much sought for because of the honor and prestige the office carries with it. On the occasion of a visit to the meeting of the city council on my last stay in Berlin, the debate on the taxing of the unearned increment was on, and among the half dozen speakers was the leader of the Prussian Diet, next one of Berlin's leading physicians, and third a Socialist deputy from the national parliament.

The successful conduct of business requires centralized responsibility. This our American plan of city government with its checks and balances and subservience to a state charter makes impossible. The way out, say the advocates of the commission form of government, is to govern by a commission of experts popularly elected. But this manifestly is not an adequate solution. The people as a whole have no means of knowing, nor are they apt to consider the qualifications that make for efficiency in business administration. No one ever heard of the stockholders of a modern business corporation like the Pennsylvania Railroad electing the president and departmental chiefs. Instead they elect a board of directors to whom they confide the task of finding the proper experts. Why not do the same in the greatest business corporations of the nation, the American city? Keep our elected council, entrust it with power and hold it alone responsible. It is evident that before we can reasonably think of going in for many of the municipal activities engaged in by the German city we must consider very seriously, first, the question of the character and organiza-

tion of our government from the point of view of its adaptability to the management of great business undertakings, and second, the fact that in America every voter has an equal voice in the conduct of the city's affairs.

This is in striking contrast to the Prussian system. There, speaking figuratively, votes are weighed as well as counted, or, to put it in terms of American business practice, the influence of the stockholder corresponds more nearly to the amount of stock he has in the city. The recognized excellence of city government is in striking contrast to its undemocratic character. As already intimated, the government of Berlin is controlled by a small number of its citizens. All men aged twenty-five or over vote, but the vote of the masses doesn't count for much. This is due to the system of voting by classes. After arranging all men who pay taxes in a list—with the largest taxpayer at the top—the names are checked off till one-third of the total taxes is determined. Then those next in the list whose taxes aggregate one-third of the total make up the second class, while those below make up the third class. The result is that a very small goup of rich men in the first class have as much power as the thousands of voters in the third. In over 2,214 precincts a third of the taxes was in 1907 paid by a single individual; in 1,703 precincts by two. Three years later, in 1910, the voters of Berlin were divided as follows:

The first group numbered 931 persons, while there were 32,131 in the second and 357,345 in the third. That means that 33,131 practically controlled the city, for they elected two-thirds of the councilors. Or, looking at it in another way, the vote of a citizen in the first class was worth 373 of the vote of a citizen of the third.

In dealing with the varied problems of her municipal life, Berlin pursues a remarkably enlightened policy, not bound by any system or theory, but following in each case the policy that at the time seems wisest and most expedient. She owns and operates gas and water works. She builds and owns street railways, slaughter houses, municipal markets, labor exchanges,

public baths, pawnshops, etc., and engages on a gigantic scale in real estate operations.

In regard to that greatest of public service utilities—transportation—Berlin, as nearly as I can judge from the actual practice of the last ten or fifteen years, prefers to leave the operation of its transportation service to private corporations. But she does this only under the most carefully drawn franchises. The terms of the franchise under which the largest of the corporations, the Grosser-Berliner Strassenbahn Gesellschaft, operates provide for a 10 pf. (2½ cents) fare within the city and to some suburbs, which, considering the distance, is said by those who know, to be the cheapest railway fare in the world; there is provision for special cars for the workingmen, for school children at the proper hours, and the maintenance and paving by the company of the streets between and adjoining the tracks; there is a stipulation securing eight per cent of the gross receipts to the city as a rental for the use of the streets, and fifty per cent of the net profits whenever the net income exceeds twelve per cent of the capital stock of 1897. On the whole, the city receives a considerable income from the different companies; more, I believe, than is paid by any other system, whether privately or publicly operated.

Closely associated with the street railways are motor buses, taxicabs and horse-drawn carriages, all under the most carefully drawn contracts. The buses make provision for the short haul so neglected in American cities. The fares vary from 1¼ to 2½ cents. The taxis afford transportation for the irregular traffic at a regulated and very reasonable price—20 cents a half mile for two persons, and 2½ cents more for each additional half mile. You couldn't step into a New York taxi and out for that. Besides the definite provisions in the franchise for fare, profit sharing, service, etc., the city exercises a close supervision over the company's building of stations, elevated and underground structures. The result is evident in the accompanying picture of stations and elevated structures.

But while Berlin entrusts the operation of most of her trans-

portation to private companies, she owns and successfully operates gas plants which supply gas to the consumers at about eighty cents a thousand cubic feet. By reducing the price of its gas, the municipality forced the private company (English company) to reduce its price also, and notwithstanding the low rate, both are prospering. The city budget for 1910 shows a net profit for the municipal gas plant of 7,490,254 marks, out of a total business of approximately 75,000,000 marks. And by net profits is meant the balance left over after all operating expenses, depreciation, interest and sinking fund deductions have been made. A similar good showing was made by the waterworks, from which the city treasury obtained a net profit of 2,820,298 marks. The same was true of the municipally owned and operated cattle market, which netted 400,208 marks in 1910; of the municipal slaughter houses, with a surplus of 134,846 marks; and of the fourteen municipal markets, with 295,910 marks. The sewers and sewer farm, on the other hand, show a loss of 2,500,000 marks, which in the present stage of the enterprise is only to be expected.

I might further dwell upon the remarkable achievements of Berlin's housekeeping, as seen in its immaculate streets and parks, public squares, civic centers, etc., all of which indicate a degree of oversight and control we find it hard to appreciate. The noiseless and efficient collection of the garbage, ashes and papers is in striking contrast with methods we are familiar with. Instead of a noisy gang of ash-covered men and wagons scattering ashes and papers in all directions, at all hours of the day, the Berliner has the collections made at night, and by a certain time in the morning all cans and other receptacles must be removed on pain of fine; the streets are cleaned, the gutters disinfected and the city is fresh and clean for the day's work. Equally scientific and efficient is the supervision over the food supply. One illustration drawn from that important item of a city's supplies, the milk, will suffice. Under a recent law, the health police are charged with the supervision of conditions at the source, involving not only the housing and

health of the cows, but their food and water. Careful rules are laid down concerning the milkman and the milking. All milk must be labeled to indicate what it is; pasteurized or fresh milk is divided into two classes, grade one containing 2.7 per cent of butter fat or more, and grade two containing less. Equally careful rules govern the delivery and sale. The milk must be kept clean, cool and free from dust on its way from the dairy to the consumer.

And what everyone at all familiar with the conditions will concede is that the supervision is real and effective. The Prussian policeman, whether he belongs to the health department or any other, takes his business seriously. In Prussia he is a state rather than a city official, and his officiousness is at times more than annoying. The German's house is not his castle when the police are concerned, and one cannot but wonder whether the universal sign of the Fatherland, "Verboten," ever and in any way applies to the police. Even joking at their expense is a serious offence. Having taken refuge with a friend from a heavy shower under a shelter, I found myself with two sober-looking policemen. I engaged them in conversation and after a few minutes, the shower having apparently passed, I jocularly remarked that I had heard it said that here in Berlin the police regulated the weather too. I wasn't arrested, but I was given to understand that I had given ample occasion.

Food seems more accessible to the poor in Germany than in most cities. It may not always be of the best, but it is always sanitary and wholesome. If it were not it would be condemned at the slaughter houses. Municipal slaughter houses are looked upon as a necessity in Europe. The two great establishments in Berlin cost about 5,000,000 marks. There the cattle, sheep, hogs, horses, etc., for the city's food supply are brought and carefully inspected for tuberculosis and other diseases. Formerly the business was done in nearly 1,000 private slaughter houses and, of course, the supervision and sanitary regulations could not be thorough. Now Berlin has fourteen city markets—

substantial buildings, all conveniently located to receive and distribute by rail, canal or team. Statistics are wearisome, but among the 2,000,000 animals slaughtered for the city's meat supply in 1910, 10,500 were horses. Numerically much stronger than the horse, however, in the bill of fare of the nation are the goose, calf, pig and duck, an alimentary quartette whose praises are sung by the "Speisekarte" of every restaurant of the capital. But to the newcomer in the fatherland, the goose seems most in evidence. "The country is white with home-raised geese and yet," to quote Mr. Collier, "they imported 8,377,708 in 1910, and 7,236,581 in 1911. . . .

"The goose is really the national bird of the German people. You eat tons of goose, and then you sleep beneath the feathers. The goose first nourishes you and then protects your digestion."

To return to municipal activities, one that is assuming truly epoch-making importance in recent years is the purchase and sale of real estate on a large scale. This is an old custom handed down from the earliest times. It is said that "no less than 1,500 towns and villages in Germany still own, and have owned right down from the Middle Ages, so much common land that their inhabitants pay neither rates nor taxes." In the last twenty-five years this tendency has assumed truly gigantic proportions, till practically every town in Germany now owns a considerable portion of the area on which it stands, while nearly all own large areas outside.

Berlin owns 54,528 acres of its administrative area and 488,-992 acres outside. (This is exclusive of streets and charitable institutions.) Professor Ely says that Ulm has in eighteen years bought 1,100 acres and sold nearly 400. But the land sold has brought the city over a million marks more than all the land purchased. Magdeburg bought land south of the city some years ago at $1.50 a square yard and sold it at nearly $20 recently.

The advantages claimed are many. By wise and liberal buying of real estate the city gets land suitable for necessary public works; for town extension which it can then direct and

control; opportunity for systematic town planning in which the city's transportation, lighting and water system, can all be articulated according to well-developed plans; and lastly, the city, instead of the individual, gets the profits accruing from the rise in the value of the land. It is not only enlightened city building, but it is good business as well.

Parallel with the effort to secure to society a share in the increased value of land by the city's purchase and holding of real estate is the new tax now enjoying almost universal application throughout the Empire—the tax upon the unearned increment. The operation of the law is simple. Thus if at the time of sale of a particular piece of land it is found that it has increased in value, say $200,000, the seller is taxed a good round percentage of the increased valuation. The new tax appears for the first time in the budget of the city of Berlin in 1910 in the form of the substantial item of 1,278,528 marks on the credit side. In speaking of taxes in general, it must be admitted that they are heavy and bear upon all classes. Taxes in Germany have always been heavy, but in recent years they have increased steadily. Added to the regular taxes, the cities in particular have been heavy borrowers; there is no limit set to their power to borrow money. The bonded debt of Berlin is $100,000,000, or about $40 per capita. But against this the city has its large real estate holdings, municipally owned public utilities of various kinds which alone cover $65,000,000 of the $100,000,000 indebtedness and which we have already seen are profitable undertakings, more than carrying themselves. Even those that do not pay as yet are increasing yearly in value like the sewer farm, which according to one authority could be sold for sufficient to retire the entire debt.

The extensive real estate holdings by the city is aiding greatly in solving one of the most difficult problems of the modern industrial city; that of housing. Berlin, in addition to being a military, official and political center, is one of the great manufacturing cities of the world and a commercial center of first rate importance. Twelve railway lines converge here and a

large commerce has its focal point on the Spree. As a result, its wage-earning class has been increasing steadily and the usual overcrowding in the labor districts has resulted. The congestion in the Moabit and other manufacturing quarters of Berlin where more than one million laborers are housed is terrible. Over 60,000 live in dwellings averaging five in a room; 731 of every 10,000 Berliners live in one or two rooms. Yet with all this, I have been astonished to find so little outward evidence of overcrowding. The hideous slums of our American city do not exist. Poverty there is in plenty, but dirt, filth and unsanitary housing conditions, none. Cleanliness and order prevail even in the poorest districts. But cleanliness and order, even with constant and scientific warfare against the incidents of poverty, are inadequate to overcome the dangers of the terrible overcrowding, and the city government has gone in for extensive rehousing projects. These vary greatly. In some cases the municipality assumes ownership and management, in others subvention and aid, and in all friendly supervision and co-operation. The available building areas are planned so as to make the reappearance of the old slums practically impossible, and in order to invite the development of vacant lands in private hands they tax the vacant lands more heavily. The cities themselves build or promote the building of model apartment houses in the city and of garden cities in the suburbs. The means of transit and other municipal improvements are developed in co-operation with the carrying out of the plans so that all departments work in harmony. "When a new suburban district is opened up the transportation facilities are at once provided, and before any building is permitted, details of streets, parks and open spaces are fixed by ordinance of the council after exhaustive study of the subject by engineers, landscape artists and industrial and sanitary engineers." (Howe, p. 161.)

In this way the districts now being opened up for the working classes afford not only very cheap rent, but loveliness and charm as well. The newest type of apartment house in Berlin has

several rooms, a tiny kitchenette, running water, an apartment kindergarten, reading room and bath, and rents at about $4.50 a month. There is a street of Altenhof at Essen, founded by the Krupps and occupied by the retired and infirm workmen. The pioneer work in this line was done in England; in Germany it appears first in the garden city at Hellerau, near Dresden, started in 1909. The great success of the venture led to scores of similar projects in all the large cities of Germany. At Hamburg over 20,000 people are housed in homes erected with the co-operation of the city upon land acquired from the municipality on long lease. Berlin is developing a fine garden city suburb on 150 acres set aside for the purpose, while Ulm with its extensive real estate holdings, comprising 80 per cent of all the land in and out of the city, has entered on a gigantic scheme of beautification and rehousing.

Equally intelligent is the handling of the problems of those who are out of work. "When unemployment has laid its gaunt hand on a man it does not take long till he feels that most priceless though intangible possession, his self-respect, slipping away from him in the haunting anxiety attending the search for work." In its Labor Exchange—"Central Verein für Arbeits-Nachweis," Berlin has lifted this miserably pathetic business on a new and respectable plane, affording both physical and moral relief to the man or woman without a job. I haven't time to describe it in detail here, but in a good building on the Gormanstrasse near the Bourse is found this most modern of exchanges. Besides the central hall or the exchange proper, there are two wings devoted to rooms, the one for the men, the other for the women. Here they are lodged at a minimum expense, given opportunities to brush up and get repaired while waiting for work. There are accommodations for over 4,000 at this place alone. In the hall for the men the different occupations have posts exactly as on 'change; sometimes these posts have dates to indicate the time the men grouped beneath first made application. The registration fee for all is 2½ cents,

or 10 pf., or if the person is a member of a contributing union he is a member of the exchange through his union. The man instead of hunting for a job remains at his club, if we may so call it, till work finds him. And this is sure to come much more quickly through this official channel than through his own humiliating efforts. Thus, while his shoes are being resoled there comes by telephone from Meyerfeld & Co., furniture movers, "Wanted ten men immediately for five days' work at four marks a day." It it is his turn and he wishes, he is drafted with others and sent to Meyerfeld & Co. Better still is the side of the Exchange for women under the excellent direction of Fräulein Krauslein. Nothing reflects so sad a light on our own *laissez-faire* methods of dealing with the problem of unemployment among women and the awful outrages daily committed against the innocent under the ægis of employment agencies, improperly supervised, than the up-to-date methods of the department for women of the Berlin Exchange. The Exchange gets the supply and the demand comes. Of the National Labor Exchange, of which this forms a part, I have not time to speak. Like the State Labor agencies recently organized in England, France, Italy and some of our own states, it forms an enlightened effort to bring the man and the job together. Not only is the self-respect and dignity of the workman guarded, but the employer is better served. A careful investigation by the City Club of New York estimates that for each job filled in that state $3 is spent in newspaper advertising alone. In Germany, the average cost to fill a job is 25 cents.

But the welfare of the German workingman is the concern of the imperial government as well as of the city in which he may live. As I have already indicated, it looks after him with solicitious care. Whether this is for selfish or humanitarian reasons, or for both, we need not stop to investigate. The main features of the State Socialism established by Bismarck thirty years ago are familiar to most of you. Under the compulsory insurance laws enacted in 1883, and since, 25,000,000 working people of Germany are today insured with the state

against accident, 16,000,000 against old age and invalidity, and 14,000,000 against sickness. The burden is equitably distributed between the employer, the state and the individual. Despite bitter criticism on the part of many, especially the Socialists, state insurance is contributing materially to the comfort and contentment of the masses. That it is a form of tutelage which assumes that the average man will not make proper use of his money is true, and there is undoubtedly a danger to that most precious of privileges, individual initiative. But despite this the legislation developed by Bismarck has been a marked success; other countries have copied it, and in principle, at least, it has been adopted by some of our largest corporations—a fact that would in itself be sufficient to assure to Bismarck a foremost place as a social reformer, even though his ulterior motive in passing the laws was to undermine Socialism by attaching the interests of the workingman to the state.

In dealing with the so-called non-productive activities like education, the German city and state act on the theory that nowhere else is there so prompt and so large a return on the investment. And they make a science of it. Educational institutions are closely articulated with the daily occupation and needs of the people. This view of the University of Berlin recalls only one type of institution. Besides the universities, gymnasia and elementary schools, there are technical, vocational and training schools of every kind, from this fine Berlin Hochschule "für Musik und Kunst," to the school for colonies at Hamburg, the college for waiters at Düsseldorf and the recent German Chinese Institute to study what China wants to buy. Indeed, to the fine courses in her technical and vocational schools, Germany owes much of her efficiency and pre-eminence in industry and commerce.

In very recent years, girls' schools in something like adequate proportion are being provided. This group is from a private school on the Rhine where they even have a girls' rowing club. Theaters and opera are regarded not as places of recreation and

amusement merely, but as educational institutions of first-rate importance. There are twenty subsidized court theaters and more than one hundred maintained by different cities. For this reason too, perhaps, the German hears more plays of Shakespeare in a week than does the English-speaking world together in a year.

Underlying the phenomenal growth of German urban population and the problems of city life, is the equally phenomenal growth of her industry and commerce. Between 1880 and 1912 the total trade of Germany increased from 5,954,270,800 marks to 21,256,300,000 marks. Of the 9,684,200,000 exports, 61 per cent consisted of manufactured products. And such products! Even a superficial study of the last Statistisches Jahrbuch für das Deutsche Reich reveals a variety of articles unequaled in any similar statement. Germany's output is not based upon a great natural demand by the commerce of the world which her natural resources naturally enable her to supply. A large part of it consists rather of a great variety of articles "Made in Germany" which are not necessities, but which contribute greatly to greater efficiency in the thousand and one activities of the human race from Greenland to Australia and Berlin to Hongkong. Nor is the utility of the article always an essential. "On a German steamer bound from South America for Bremen, I once met a young German," says Mr. Whelpley, "who excited my attention by his alertness to all that was going on about him and by his persistent thirst for information about other lands than those he knew. I finally asked him what took him about the earth so much. He looked at me a moment, and then said:

" 'Now don't laugh, and I will tell you. I sell perfumery.' I looked at his six feet one of brawn, his good and tasteful clothes, and thought of the five languages he spoke fluently, and I said:

" 'But I thought France had almost a monopoly of that business?'

" 'Yes,' he said quickly, 'of the kind of perfumery you use

and all these people about us use. I sell ointment to the naked savages of the world. The louder it smells, and the cheaper it is, the better they like it, and we've got the world beaten in that line.' Here he chuckled a bit as he added, 'A man would be arrested as a public nuisance if he exposed it for sale in a civilized country. It's awful, but it's what they want.'"

In the last twenty-five years Germany has taken rank with England and the United States in industry and commerce. She has developed the greatest and most efficient national working team the world has seen, and through the remarkable co-operation of the captain of industry, the banker, the chemist, the engineer, the traveling man, the school teacher and the workman, the nation bids fair to lead the world, even though a considerable percentage of the output is from by-products—especially coal tar. She needs markets, world markets, for her output, but she is less a competitor than is generally supposed.

Indeed, in estimating the place of Germany in the world's commerce, the important fact is often overlooked that her industrial and commercial activity are so largely complementary to that of other countries. Not only does sixteen per cent of her total imports consist of manufactured articles, but a further fifty-two per cent is comprised in raw or partly finished materials, for manufacture. These extensive purchases abroad are of great significance in the trade of the world. Increased efficiency and production has also brought increased demands and increased power of consumption.

Although leading the world in actual wealth, according to Steinmann-Bucher's recent work, "Das reiche Deutschland," Germany has as yet no surplus capital. Her wealth is all absorbed in industry, commerce and production. But her savings bank deposits are growing very rapidly; the earning capacity of 67,000,000 people trained to the highest degree of technical skill is tremendous.

Germany's railroads are in the main owned and operated by the state, but despite this the government has pushed the

building of canals and internal waterways with great energy. They afford cheap transportation, especially for bulky commodities, and constitute a definite competition to the railroads. But expense is not considered in the effort to aid the manufacturer or the agriculturist to market his goods in the cheapest way possible. Virtually all great industrial areas have water as well as rail transportation.

To secure the safety not only of her foreign commerce but of her very existence, Germany has built a powerful navy, because to be deprived even for a week of the raw products of the partly manufactured articles and of the foodstuffs now daily entering her ports would bring disaster. The navy, like the army, is under existing international conditions a necessity. Necessity, and necessity alone, can account for the fact that while the Germans had not a vessel to defend her "kith and kin" against little Denmark in 1848, she now has the second navy of the world. That the same may be said with equal truth of the army is less apparent. But there are those who believe without the shadow of doubt that the army is an essential and absolutely necessary institution of present-day Germany. "Ohne Armee kein Deutschland" is a creed of almost universal acceptance in the Fatherland, and hence the nation is accepting the extra billion war tax with comparative equanimity. "Be of good cheer," writes Steinmann-Bucher in his recent work; "you can afford it. The more we develop our means of war through scientific taxation and finance, the stronger guarantees of peace we create. The deeper we look into the factors of power within our own economic life, the greater becomes our obligation not only to insure peace for ourselves, but to force it upon the nations among which we have so great a preponderance."

Germany is the geographic center of the continent. She is surrounded on every side by enemies as powerful or more powerful than herself, and until international arbitration has progressed considerably further than at present, Germany's army it is claimed is a more powerful factor for peace than for war.

That it has proven to be so under the present Kaiser is well

known. Even the army and navy have become the exponents of the new Germany. The ideal of the "mailed fist" is being superseded let us hope by that of business and enterprise. In the process of raising the commerce from $31 per capita to $75, a new nation has arisen. Just as the older idealistic Germany of Goethe and Schlegel made way for the military Germany of Moltke and Bismarck, this in turn is being replaced by the industrial, commercial and imperial Germany of the Hamburg-American, North German Lloyd and of William II.

This great economic transformation with its attendant shifting of the centers of population has had a very serious effect on the political life of the nation. The government established amid the victories of 1870 provides for universal manhood suffrage at the age of twenty-five. But the effect of this is today very largely destroyed. First, by the fact that the election districts are still the same as in 1871. As a result the town populations are almost disfranchised in the interests of the rotten boroughs of the rural districts. The constitution makes no provision for redistricting. Second, because of the small degree of influence of the Reichstag in the government of Germany. As an example of the operation of the first, the district of Teltow, near Berlin, in 1907 had 248,000 voters, while Lauenburg had 13,000, yet both sent up one member to the Reichstag—*i. e.*, one citizen of Lauenburg counted as much in the Reichstag as did nineteen from the Berlin suburb. Examples could be multiplied. In the elections of 1912, it took 38,640 Socialist votes to secure one deputy, 25,697 for a Conservative member, and still fewer, 22,186, to elect a member of the Centre party. Notwithstanding this, however, the Socialists are the strongest party in the Diet, with 110 members. Their voting strength in the Empire has increased with rapid strides, from 101,927 in 1871 to 4,250,000 in 1912. But even if the Socialists should get a majority in the Diet, the autocratic system would not be seriously weakened, because, as already stated, the Diet has too little power. The reasons are simple. The Reichstag is a consulting and co-operating body in govern-

ment. It does not even control the purse strings. To withhold supplies is ineffective even if the Reichstag so voted, for its veto is not sufficient to prohibit their collection. All existing taxes will (according to writers on German law) continue automatically. Besides it is a serious matter for any party or any members to oppose the autocratic system too strongly, for, according to paragraph 63 of the Constitution, "The whole of the military forces of the Empire will form a homogeneous army which is commanded by the emperor." He "appoints the imperial officials, has their oaths taken, and effects their dismissal if required." The emperor disposes of 800,000 soldiers in time of peace and 1,350,000 officials. By Article 18, he can dissolve the Reichstag, and as demonstrated recently in the unfortunate conflict between the military and civil authorities in Alsace, a vote of confidence in the emperor's chief minister can be ignored with absolute impunity. Germany has a parliament but not a parliamentary government. The army and navy estimates are beyond the reach of the Reichstag, the taxes, save new ones, are fixtures and if the members of the Reichstag are too cantankerous they are dismissed with a wave of the hand. Though intellectually a republic, Germany is politically still in a state of tutelage.

Only a few years ago a member of the Conservative party in the Reichstag said in a speech, "The King of Prussia and Emperor of Germany must be able to tell a lieutenant at any time, 'Take ten men with you and close the Reichstag.'" And in this autocratic attitude the mighty party of feudal conservatives who hate democracy have the support of Bismarck's emphatic utterances made shortly before his retirement. In a letter to Herr von Hellerdorf, the leader of the Conservatives, Bismarck wrote, "I will devote the last years of my life to correcting my greatest mistakes, the universal vote and the secrecy of the poll." According to Professor Delbrück, he even planned a *coup d'etat* to this end.

Nor has the Kaiser in any way surrendered the prerogatives of his crown. Instead he has rather asserted them emphatically

and repeatedly, as, for example, when he declared "für mich sind die Worte 'von Gottes Gnaden,' kein leerer Schall," or when, on another occasion in a moment of exuberant energy, he voiced his sense of absolutism in the words, "sic volo, sic jubeo." How different all this from the conditions described among the early Germans by Tacitus: "No man dictates to the Assembly. He may persuade, but he cannot govern." Yet in practice Emperor William II has been liberal and open-minded, one of Germany's most progressive monarchs. He has kept the peace for over twenty-five years despite the power of militarism. He has impregnated German life with his own ideas. Not a problem in the history of his people during the last twenty-five years on which he has not had independent and decided opinions. He always takes sides, and with characteristic energy and partisanship born of strong convictions he has always endeavored to impress his ideas on others.

Whatever may be the outcome of the present political controversies in Germany, it is evident that both state and municipal governments are undertaking a much wider scope of activities than do ours. They have left far behind the concept of the state, so prevalent in the first half of the nineteenth century, that government existed only to protect life and property, impose military service and levy taxes. Nothing could be further removed from the German theory and practice than this old *laissez-faire* idea. Instead there is everywhere a clear recognition of the rights and claims of society as a whole, of the social consciousness that has completely superseded the individualistic, and of the fact that many of the services once regarded as independent are really of necessity collective in their interests and therefore must be controlled by the social group. Business rather than politics prevails in city management, social duties and social rights take precedence over individual rights, and social service is the conspicuous characteristic.

THE IMPROVEMENT AND RECONSTRUCTION OF SUBURBAN AND COUNTRY ROADS TO WITHSTAND WEAR FROM MOTOR-DRIVEN VEHICLES

By William Easby, Jr.

Professor of Municipal Engineering, University of Pennsylvania

The good roads question has become sufficiently broad to include questions of governmental policy and legislation in matters pertaining in any sense to highways and also questions of construction, maintenance and administration. To those responsible for the usefulness of our highways the good roads question, however, presents itself principally in these inquiries:

1. What may be done, short of reconstruction, to adapt our present suburban and rural highways to combined motor-driven and horse traffic.

2. What form of construction, reconstruction and maintenance is most advisable in any locality, all things considered.

That the road builder has been unable to answer these questions as satisfactorily as could be desired is attested by the poor condition of many of our most important highways. He has found himself unprepared for the new road problem imposed in a most urgent form by an unprecedented increase in the use of highways and by a most destructive form of traffic. Just as he has learned to construct and maintain the ordinary macadam and telford road with fair success, he is confronted with this new problem which he has sought to solve by the use of materials with greater binding power than stone dust, principally of a bituminous nature. Many of these bituminous materials (petroleums, tars, pitches and asphalts) possess merits as binders which strongly recommend them for road use, while others are almost valueless. Both classes have

been used with a lack of knowledge of their properties and consequently with many failures, involving, if the full truth were known, an inexcusably large loss. In the last few years these substances have been studied closely with the object of determining their value as road materials under various traffic and climatic conditions. Much information of value has been obtained, some questions are but incompletely answered and others, involving commercial interests, are subjects of considerable controversy, as is to be expected. Out of the confusion of conflicting interests and opinions one point stands out prominently, *i. e.*, that in the present state of the art of bituminous road construction the competent and fair-minded specialist can render a service immeasurably greater than is represented by any fee which he is likely to receive, and that failure to secure such assistance is therefore inexcusable.

I do not wish by these remarks to give the impression that the whole field of the modern improved highway is necessarily covered by the use of bituminous substances, for in both hydraulic cement and vitrified brick we find materials which demand consideration.

Much has been said and written respecting the extent of damage to highways by automobile traffic and the causes. On this second point there is now naturally less controversy than in the past, since the importance of road preservation has increased from year to year, demanding careful and intelligent observation and study of the factors involved. The following statements, it is believed, well summarize the opinions based on these observations.

1. Substantial, well built roads suffer less than those which are unsubstantial and poorly constructed.

2. The greater the volume and weight of traffic, the greater the damage. Mixed automobile and horse traffic is more damaging to bituminous surfaces than the same volume of the former alone.

3. Independent of the nature of the traffic, the surface wear has been greatly increased by increase in the volume of traffic.

4. The damage increases with the speed, but at a greater rate; theoretically as the square of the speed.

5. Non-skidding devices are both an advantage and a disadvantage, compared with the action of smooth tires. While they generally prevent damage from side slip, when they fail to do so their effect is very destructive to the ordinary broken stone road surface.

6. It is generally recognized that the shearing or grinding effect of the rear or driving wheels, which is most severe when accelerating or retarding the machine, is the greatest source of damage to earthen, gravel and water-bound broken stone roads. This force may often be as much as 400 pounds for each driver. By its application the surface cementing material which is in finely divided condition is removed, appearing as dust, much of which does not settle again on the road to recement it when wet and thus protect it, but is blown to the roadside and adjacent land by the air currents occasioned by the rapidly moving machine which creates a partial vacuum in its wake and to a much less extent under the drivers. At curves there is an additional shear acting across the road through change of direction, and a secondary shear at all times from the flattening of the tire at its surface of contact with the road.

7. The rubber tire, unlike the steel tire and the action of the horses' shoes, produces no binder by abrasion to replace that which is removed. This comparison is misleading, however, if we fail to consider that apart from the nature of tires, their effect on the road is much influenced by the loads which they apply to the surface and greatly by speed.

8. Heavy motor trucks and traction engines have introduced another factor of a most serious nature; *i. e.*, they bring on the road loads greater than its supporting capacity, displacing the stone in the body of the road without necessarily waiting for the destruction of the surface. Stone roads adapted to such traffic must have well compacted subgrades; must be well rolled to secure close interlocking of the stone and must be

thick enough to distribute the wheel loads over so large an area of the subgrade that the intensity of pressure thereon will not exceed its supporting capacity.

The water-bound broken stone road has represented, until quite recently, the highest type of suburban and country highway. Data from the United States Office of Public Roads show that five years ago there were about 60,000 miles of such roads in this country which I estimate cost not less than $400,000,000. Their maintenance cost has increased greatly in many sections since 1907, when the wear from automobile traffic commenced to assume importance. It is well recognized that this traffic has been a potent factor and undoubtedly the main one in the present world-wide movement for the extension of hard-surface roads and, as will appear later, this influence has not been altogether beneficial. For the present, however, I desire to present some approximate data which will show the enormous interests involved in both the manufacture and ownership of power-driven road vehicles in the United States alone. The number of autos of all kinds registered in the United States in 1912, allowing for duplicate registration, is 1,010,000. For 1913, the corresponding figure is about 1,250,000; classified as follows:

Gasoline passenger cars	1,125,000
Gasoline commercial cars	72,000
Electric passenger cars	34,000
Electric commercial cars	18,000
Total	1,249,000

The annual production of automobiles of all classes in the United States from 1903 to 1912 has been more and more accelerated. If the rate for 1912 should be maintained for the three years following, the output in that time will be nearly 900,000 and if accelerated, as might reasonably be expected from the experience of the last few years, it should reach 1,000,000. The significance of these data in a consideration of the question before us is too evident to require explanation.

For the purposes of this lecture, rural and suburban highways may be divided into the following three groups and will be considered in the order given:

1. Earth: meaning those composed of the naturally occurring material in place, excluding rock and gravel.

2. Constructed of medium size to small pieces of stone or other hard material held together by some cementitious substance.

3. Brick surfaces with various kinds of foundation.

The earth road, while not ordinarily in favor with automobilists, deserves from them and from the public generally a much fuller consideration than has been accorded it, for the following reasons:

Such roads in the United States constitute from 90 to 95 per cent of the total mileage, which is approximately 2,100,000 at the present time, and while the percentage is considerably smaller in the older districts of the country, it is still large and likely to remain so for many years, even though Federal and State appropriations should be much larger than the most enthusiastic good roads advocate could dare to hope for.

The improvement of earth roads must precede the addition of hard surfacing. It should be recognized that poor earth roads are often due to causes which are in large measure removable and at an expense small in comparison to that required for the repair and maintenance of other forms of country roads. If funds are limited they cannot be spent to better advantage than mainly in providing underdrainage where the ground water lies too close to the surface to permit of a firm foundation; furthermore, this is an essential to the construction of the improved hard surface which may confidently be expected in time.

The maintenance of earth roads consists principally of keeping the surface smooth and the middle higher than the sides by the use of drags or scrapers, for the purpose of effecting a quick removal of rain; in addition, the side gutters must be kept open to carry away the surface drainage. If water is per-

mitted to collect along the roadside in obstructed or poorly graded gutters it has an opportunity to soak into and soften the roadbed. A very common defect in maintenance, especially when graders are used, is the formation of a ridge or shoulder between the gutter and the roadway caused by not carrying the blade of the machine far enough to the sides. A secondary gutter results which interferes badly with the surface drainage. The labor and expense of maintenance could be reduced by a more general use of mechanical power in place of the hand and horse power now commonly employed.

A form of earth road used largely in the South is the sand-clay road, which, as the name indicates, is composed of a mixture of sand and clay. When compacted it is neither loose like a dry sand, nor excessively sticky like a clay road if the clay used is of the non-slaking kind. These roads become progressively better under traffic if ruts and depressions are filled and sand or clay added where deficient, and have proved a boon to communities where other road material does not occur. Sand-clay roads have been constructed in the South at costs ranging generally from $300 to $800 a mile. Brief mention should also be made of burnt-clay roads. They are built in localities where hard-road materials, including sand, are scarce and where certain clays known as gumbo and buck-shot are plentiful. It has been found that these clays will, when burned at a moderate temperature, form a dry, non-plastic clinker which has given fairly good service as a road material for a moderate volume of traffic.

In any general consideration of automobile roads, earthen roads and allied forms should not be omitted. It is true that under prevailing methods of maintenance they are far from satisfactory, especially as regards the excessive formation of dust, but under such maintenance, as has been indicated and by use of dust preventives, the speaker can see no good reason for excluding them, particularly when used for moderate traffic.

Dust preventives are substances, usually in liquid conditions, employed for the purpose of holding together and preventing

the removal of the fine particles of road material which originate on the road surface and which are carried there by traffic. These substances perform their function by wetting the surface of the road and become ineffective as soon as evaporated or volatilized. They require frequent application and leave the road surface little, if any, permanently improved at the end of a season. The substances most generally used are water, certain light oils and mixtures of oil and water known as emulsions. Dust preventives serve two distinct purposes:

1. They relieve the users of the road and those who live along it and nearby from both the menace and annoyance of a dust-laden atmosphere; furthermore, with the increase of the dust nuisance there must follow a serious depreciation in the value of property.

2. By preventing the removal of the surface binder in roads constructed of broken stone and gravel, the raveling or dislodgement of the surface stone is prevented and with some oils a thin surface coat or mat is formed which protects the surface from wear if tires do not cut through it.

Substances which serve as true binders have either a semi-permanent effect or an effect of sufficient duration to justify the use of the term permanent. To the first class belong certain sticky petroleums (asphaltic and semiasphaltic) and residuums obtained therefrom by distillation, and certain coal tars and their liquid residuums. These are used mostly on the surface for dust preventives and their repeated application results in a coherent surface mat, often of considerable thickness, which protects the road from wear. Permanent bituminous binders comprise very sticky or viscous and almost solid residuums from petroleums with asphaltic and semiasphaltic bases and the very viscous to solid tar residuums known as pitches. These substances are used to cement together the broken stone or gravel in the body of bituminous concrete roads (to be described) and in supplying a top or wearing course to water-bound macadam roads. No sharply defined line can be drawn between dust layers and semi-permanent

binders and between the latter and permanent binders, as these substances differ more in the degree in which certain useful qualities are present than they do in kind.

The word ***bitumen***, as used in road work, is a class and not a specific term. With our present knowledge, bitumens may be defined provisionally as mixtures of naturally occurring hydrocarbons and substances obtained therefrom and from certain coals by destructive distillation. A great variety of bituminous substances is employed in road work at the present time. Their satisfactory consideration in a non-technical form is beset with difficulties since both their physical and chemical properties differ in particulars which affect their value as road materials and which cannot be generalized without leading to superficial statements and those requiring qualification. These substances have already been classified with reference to the general purposes for which they are used. In this connection there are two points which should be emphasized:

1. The value of a bituminous substance for given traffic, climatic and soil conditions should be based on the fullest information obtainable respecting its permanency in the road and the facility and cost of using it in the road.

2. Analyses should be sufficiently frequent to insure uniformity. Pertinent to this statement is the following quotation from Hubbard's "Dust Preventives and Road Binders": "Many instances might be cited of road oils varying inexcusably in character, which have been sold under the same trade name as representing a definite product. Until certain standards are adhered to, it is therefore useless to give analyses of trade products as representing anything definite." This criticism is now less justified than in the past, since manufacturers are, in their own interests, endeavoring to improve and standardize their products and there will doubtless be progress in this direction such as has been witnessed in the last ten or fifteen years in the cement industry.

Oiling Earth Roads and Oil-Earth Roads.—The surface must first be put in good condition by filling ruts and depressions

and reshaping with a drag or scraper. Light crude oils have been used to a considerable extent in treating such surfaces to suppress dust. Several light applications during a season are better than one heavy one. Good judgment is required in determining the amount to be used and when an application will be of most benefit. In wet weather, even under the best management, a greasy surface mud is formed, but to a much greater degree with paraffin and semiasphaltic oils than with those which have a strong asphaltic base; in fact, the first should not be used. Climatic conditions have much to do with the success of light oils as dust palliatives. In this country they were first used in California, where the dry climate has led to a much greater measure of success than is to be expected in climates such as ours. Earth surfaces have also been treated with the heavier oils with somewhat greater success, but this practice is giving place to the incorporation of the oil with the body of the road, resulting in the oil-earth road which may be constructed most simply by removing the earth to the depth of five or six inches, depositing it on the roadside and then rolling and heavily oiling the subgrade thus uncovered. The earth is returned with a scraper, spread, crowned and rolled. In time, traffic brings the oil to the surface. This result may be hastened and the more intimate mixing of the oil and earth accomplished by the use of harrowing and tamping machines, calling for some variations from the process just described. The application of water during construction is of assistance in the mixing. Sandy loams with hot asphaltic or semiasphaltic oils give the best results and clayey soils are the most difficult to treat. An important objection to these mixed roads is that the binding oil, even in dry climates, hardens so slowly that the surface cuts badly under traffic and therefore requires constant attention. Eventually a satisfactory road is secured, but at a cost which would often suggest the adoption of gravel-oil or stone-oil constructions as more economic in the long run.

Gravel roads, if built of a gravel with good binding properties, will with a moderate amount of asphaltic oil applied to the surface have the bond increased sufficiently to enable the road to carry automobile and moderate horse traffic. If the original bond of the surface is weak, shown by the looseness of the upper course, the oil may be mixed with the course by raking. The surface is then to be rolled. Oil-gravel roads, like oil-earth roads, are constructed by mixing the oil throughout the body of the road material, which is laid in two courses, each well rolled, giving a thickness of eight or nine inches. A sealing coat of oil with sand completes the construction. Water, either in the foundation or entering from the surface, is the enemy of these oil roads and must be avoided by underdrainage and by the maintenance of a smooth, well-crowned surface.

Construction and Maintenance of Water-bound Broken Stone Roads

There is a widely prevailing public opinion, shared by many engineers, that the construction of water-bound stone roads should be much restricted. This opinion is well founded, even though such roads are giving fair service in some instances. When this is the case inquiry will generally show that the volume of automobile traffic is light and the road unusually well built and maintained.

Stone roads are usually constructed in two or three courses, giving a total thickness varying from six to twelve inches. Each course should be well rolled and the upper surface made water-tight and smooth by rolling into it stone dust and fine screenings in a wet condition. Maintenance should begin from the day the road is put in use to make good the destructive effects of traffic and climate. Such rigid care is unusual in this country and the surface becomes irregular and rutted, interfering much with the surface drainage. It is then patched from time to time where most needed, but suffers on the whole a general deterioration through which its value decreases,

finally demanding reconstruction of the surface course, if not of the lower course also. Rutting usually indicates an insufficiently bound road or one in which a poor grade of binder is used, excessive wheel concentration or all of these conditions. Perhaps the most common defect is the wearing of the surface into depressions or pot-holes, which rapidly increase in size from the softening effect of rain and impact of traffic. As soon as a road begins to show the bared surface of the stone in the top course, binder should be applied. Another common defect in maintenance is to permit long grass and weeds to occupy the shoulders of the road and the gutters, greatly impeding drainage. It has been well said that water must be kept off the road, out of it and away from it. This is particularly important in climates where frost occurs. Even with the best drainage, stone roads are apt to be somewhat yielding and loose in the early spring, and are greatly benefited then by heavy rolling.

The method of patching commonly employed is to place loose stone in the surface depressions and ruts and depend on traffic to do the consolidating, a practice not to be recommended, since much of the stone is strewn on the surface and the voids in that which remains are filled with road detritus which is entirely unsuitable for a binder. The better practice, used in some European countries, is to cut out a patch the thickness of the upper course and large enough to include the depression and then to fill the hole with new stone and binder and firmly tamp. If the surface becomes generally uneven without much loss of stone, loosen it to a depth of two or three inches (best accomplished with a scarifier), distribute the loosened stone, rake it to the proper form and reroll. If the road has worn thin the surface must be roughened and enough stone added in a course to restore the original thickness. These two operations are known respectively as regrading and recoating. The latter affords the fullest opportunity of substituting the more tenacious bituminous binder for fine stone screenings, a form of construction to be described.

Bituminous Treatment of Broken Stone Roads

Dust Prevention and Surface Treatment.—As a prerequisite for success the surface must first be made smooth and even. If there are any ruts, pot-holes or other irregularities they must be freed from loose road detritus or mud and filled with a coarse stone coated with a strong binder. The patches should then be tamped, but are frequently left for traffic to compact—a practice which does not secure the best results.

Surface treatment may consist simply of the application of a light oil to the repaired road, principally with the object of laying the dust and preventing its further formation. This it may accomplish without adding much to the permanency of the surface, for it has been found that roads so treated cannot stand up against the action of autos at high speed. The amount of dust which may properly be left on the surface before oiling depends on the readiness with which it absorbs the oil; hence, heavy oils and tars require that most of the dust shall be removed. This question can be decided by short test stretches of the road swept with different degrees of completeness. Oil should not be applied to a really wet surface, but one which is damp is in better condition than a loose, dry surface. For light traffic roads, if a good asphaltic oil is used as frequently as the suppression of dust requires, a thick semi-permanent coating will be formed in time, but much money has been wasted in this merely superficial treatment in an attempt to cheaply meet traffic conditions which demand a much more substantial surfacing.

Roads with foundations free from water and substantial enough to receive without damage the loads applied to them by traffic wear out from the surface, downward; hence, if a protective surface coating can be maintained the road, as a whole, becomes permanent. The lightest form of covering which affords protection against ordinary traffic is constructed by covering the well-swept macadam surface with a coat of bituminous binder over which is spread a thin layer of coarse

sand, gravel or stone chips. Two such courses are generally used and give a coat about one-half inch thick. It is essential that the macadam surface be thoroughly swept, removing enough of the stone binder to permit of a good bond without at the same time disturbing the stone. It is also essential that the screenings, sand or gravel be free from dust, as its presence lessens the adhesion of the binder. The courses of the wearing surface are usually compacted with a roller light enough to avoid crushing the stone and displacing the binder. Continuous maintenance is the price of success with surfaces of this nature, which receive their most destructive wear from mixed horse and automobile traffic—the former subjecting the road surface to the picking action of the horses' shoes and the cutting action of narrow steel tires.

Distributing the Binder.—In forming the protective coverings described the necessity of properly preparing the old road surface has been emphasized. Of scarcely less importance is the uniform distribution of the binder in proper quantities. This is accomplished with distributors of various descriptions, often in conjunction with brooms to assist in the spreading. These machines may be classified as gravity distributors and pressure distributors. Both consist of some form of wheel tank, usually with arrangements for heating the contents and some form of distributor in the rear of the tank, connected therewith and supported not far from the road surface. Gravity machines simply permit the binder to drop from perforated pipes and nozzles directly on the road surface, or first on a baffle board from which it runs in a more or less uniform sheet. Pressure distributors differ from the foregoing in the provisions made for applying the binder under pressure. It is claimed that with the pressures used (30 to 50 pounds) a more uniform distribution results than by gravity and that the binder penetrates the surface. Distribution is also frequently accomplished by hand pouring from cans with broad spouts especially designed for this use followed by brooming, but the results are likely to be less uniform than by machine.

Resurfacing Broken Stone Roads.—Resurfacing differs from surface treatment principally in the depth to which the operation affects the finished road and in the use of much larger stone. It consists of adding to the surface of the stone road a course about three inches in thickness composed of ¾ to 1½-inch stone, either coated with the bituminous binder before being placed or receiving the binder after being placed. The first is known as the mixing method and the second the penetration method. Very briefly stated, the main details of construction by the first method are as follows. If the old surface is generally uneven it is to be regraded and rolled, as already described for broken stone roads, or it may require only patching here and there. To secure the best bond all dust must be removed from the old surface, but this desirable condition cannot be fully met, particularly when much fine material has been used in the upper course, as in roads built from the full output of the crusher, for the sweeping continues to bring dust to the surface. It is customary to require perfectly dry surfaces, but good results have been obtained when they were slightly damp and it has been claimed that this condition lessens the interference of dust with the bond of the surface coat.

The bitumen-coated stone is to be evenly spread while hot on the prepared surface and the material should be of uniform density. It should then be rolled or may first receive a coat of sharp, clean sand, fine gravel or clean stone screenings to fill the voids and to prevent the roller from sticking. After rolling, the surplus fine material is swept off and a sealing coat of oil or tar is applied, followed by another coat of fine stone. In the penetration method the old road surface is prepared in the way just described. On it is evenly spread a three-inch course of broken stone, ¾ to 1½ inches in diameter, which is thoroughly rolled. Either hot or cold binder is then distributed by hand or machine and penetrates the course. To well coat the stone requires about one and one-half gallons of binder per square yard. Dust-free screenings are then

spread in a thin layer over the surface and rolled, as in the mixing method.

All of the foregoing applications of bituminous materials are in the nature of surface improvements or of partial reconstruction and lead naturally to the consideration of forms of complete construction, in which such materials (heavy asphaltic oils, refined tars and mixtures of tars and asphalts) find their fullest use. It will be convenient to observe here the two methods of introducing the binders, already described under resurfacing. To the first (by penetration) it has recently been proposed to apply the names bituminous gravel and bituminous macadam construction, and to the second (by mixing) the name, bituminous concrete.

Bituminous macadam roads are constructed in two main courses, the lower about four inches thick and the upper two to two and one-half inches. The binder is usually confined to the upper course and to the additional thin sealing course or courses which are necessary when there is a heavy mixed traffic. The preparation of the subgrades and construction of the first or foundation course do not differ from ordinary macadam construction, except that it is necessary to have the surface voids sufficiently filled to prevent the draining of the binder from the upper course. This is not likely to take place if the run of the crusher has been used in the foundation, otherwise screenings must be thoroughly rolled into the surface. There is considerable variation in the details of construction of the upper course. Sufficient binder is applied to it to coat the stone. The binder is also sometimes spread on the foundation before the upper course is placed, in which case penetration is from both sides. The upper course may or may not be rolled before the binder is applied. It is probable that too much rolling at this stage prevents good penetration, but this also depends on the size of the stone. The surface may be sealed by one or more coats of binder and small stone chips. Thorough rolling to compact the several courses is of the greatest importance. Within the last four years from 1,500 to 2,000

miles of bituminous macadam roads have been built in the New England and in the Middle States alone at a cost approximating that of the water-bound macadam road and, if due allowance be made for the lower maintenance cost of the former under a combined traffic, it is usually more economic.

That the form of road under discussion has its defects is well known. Its failure may be largely attributed to the use of unsuitable materials, improper methods of construction and carelessness in carrying out details. To particularize, the binder may not be uniformly distributed, and the stone may be segregated so that it occurs in patches of coarse and fine material, both conditions affecting the penetration. The stone may be either wet or dusty and dirt may not be excluded from the road during construction, affecting the bond; or the bituminous material may be damaged by overheating.

Bituminous concrete roads embrace the most important forms in which bituminous substances are used as binders. Their distinguishing feature, as a class, lies in the manner of forming the upper course. Instead of pouring the oil or tar over the stone or other aggregate in place, as in the penetration method, these ingredients are first mixed in much the same way as ordinary cement concrete and then spread on the lower course and rolled. Bituminous concretes may differ much; first, in the kind, size and grading of the broken stone, gravel or slag used, and in the kind of fine mineral material used as a filler; second, as regards the kind of bituminous binder used; and third, in details of construction. Even a brief statement of the many forms of this type of road, and of its advantages and disadvantages must be omitted for lack of space.

The mixing method of construction requires more extensive machinery than does the penetration method and for this reason is the more expensive, but it is also the more reliable, for there is less uncertainty respecting the completeness with which the aggregate is coated with binder.

Concrete Roads

Hydraulic cement concrete has long been used as a road foundation, but only within the last ten years has it come into use to any extent in this country as a wearing surface. The preparation of the subgrade for concrete roads does not differ essentially from that required for other forms. The thorough compacting of the subgrade has been very generally slighted, with the excuse, where concrete has been used, that this material is strong enough to bridge over the soft spots. That in many instances it does not do this successfully is well known, and to insure greater reliability in the road a greater thickness would be necessary, involving greater cost. Only under the most urgent circumstances should a concrete road be placed on an earthen fill or embankment which has not stood several months after compacting, for there is almost always subsequent settling. Effective drainage of the subgrade is of the greatest importance with roads of this kind and is more easily secured with soils of a sandy or gravelly nature than with those which are clayey.

There are two general classes of concrete roads: those in which the ingredients are mixed before being placed and those in which the broken stone or other coarse aggregate is spread in uniform layers and the voids then filled with a very thin cement mortar, rolling being continued at the same time. By far the greater proportion of cement roads belongs to the first class.

To insure a satisfactory road the subgrade must be prepared as already described and the following additional requirements must be fully met:

1. The materials for the pavement, including water, must be clean.
2. The surface of the subgrade must be wet enough to keep it from absorbing water from the concrete.
3. The constituents of the concrete must be sufficiently and uniformly mixed and the mixture must be so placed on the road as to prevent as far as possible the separation of its parts.

4. The ingredients of the concrete, including the water, must be proportioned by actual measurement.

5. Mixtures in which the cement has commenced to set must be excluded from the road.

6. The surface of the finished road must be kept wet for several days.

In general, the old rule of thumb ways of construction must be absolutely replaced by the exact methods which experience has made it possible to specify in great detail, although doubtless provisionally in some respects.

Concrete in the exposed situation which it occupies when placed in a road is subject to important variations in its volume from both temperature changes and the absorption and loss of moisture. Internal forces result which cause the road to crack. This being the case, joints extending through the road are constructed across it in an attempt to relieve the stresses along these predetermined lines and thus prevent cracking elsewhere. A recent study of the Wayne County (Mich.) concrete roads, which probably represent the best practice in construction, leads to the belief that many of the longitudinal cracks which they have developed are due to insufficiently drained and compacted subgrades. It is customary to fill cracks with some substance which will not prevent the movement of the pavement, bituminous mixtures being most in use. Apart from their unsightliness, cracks are objectionable, as they establish lines of wear. Another defect which there is more hope of eventually avoiding is the formation of depressions caused by lack of uniformity in the surface concrete.

The cheapness with which the concrete road can be built is a point greatly in its favor, but like other roads it is not adapted to all traffic conditions and to all localities.

Brick Country Roads

Certain kinds of clay when formed into blocks and partially vitrified furnish a hard, tough paving material which comes to

the workman as a finished product requiring only placing, instead of a material formed during construction from aggregate and binder, the value of the mixture depending much on conditions demanding close control.

Concrete foundations, four to six inches thick, are commonly used, as experience has shown that sand, gravel, broken stone and brick laid on the flat, all of which have been employed, often fail to give the continuous, rigid support which is essential for the preservation of a smooth wearing surface. The concrete foundation has the important additional advantage of affording a ready means of supporting the edges of the pavement by carrying the concrete to the surface in the form of a curb.

The joints between the bricks should be filled with some substance which will both protect the edges from wear and act as a strong bond. Cement introduced as a very thin mortar or grout meets these requirements and is now generally used. The advantages are not, however, all with this material. Its use results in a rigid surface layer or crust which does not adjust itself satisfactorily to the expansive and contractive effects of temperature changes, and the charge is often made that a grout-filled pavement is more noisy than those in which sand or some bituminous substance is used. The latter also provides well for expansion and contraction. With the grout filler, a bituminous expansion joint is placed at each curb for the whole length of the paved roadway and sometimes transversely, although the latter is inadvisable since it is too soft to protect the edges of the bricks.

Brick roadways become uneven and exposed thereby to excessive wear principally from three causes: weak foundations, non-uniform density of the sand cushion placed between the brick and the foundation, and the lack of uniformity in the hardness and toughness of the brick. Close observation and prompt repair for the first few years will remove most of the defects if the pavement has been well constructed. After this the cost of repairs should be almost nil and that of maintenance but little more than the cost of cleaning.

The first cost of brick roads with concrete foundations is high as compared with the forms commonly used outside of urban districts; but roads of high first cost and of low annual cost are much oftener justified by considerations of true economy than practice indicates. Quantity more than quality, with but little concern for the future value of the road, influence too much the selection of the kind to be used. As a compromise, narrow paved strips with earth, gravel or broken stone shoulders may be adopted where the volume of traffic is not too great. An eight-foot paved strip on a four- or five-inch concrete foundation will cost in the vicinity of Philadelphia about $12,000 a mile, an amount not much in excess of the cost of many improved rural roads of about twice this width.

PLANT LIFE SEEN BETWEEN PHILADELPHIA AND ATLANTIC CITY

By John W. Harshberger

Professor of Botany, University of Pennsylvania

The history of the New Jersey pine-barren region begins with the marginal plain known as the pre-Pensauken peneplain covered with a fairly uniform vegetation. With the beginning of the Pleistocene, part of the Atlantic coastal plain was depressed, but an island, representing the Beacon Hill formation, was covered by the remnant of the ancient coastal plain vegetation. Pensauken Island was separated from the mainland by Pensauken Sound and when the land emerged again the pine-barren vegetation occupied an area coincident with the outlines of Pensauken Island, retaining these boundaries up to the present as a new vegetation surrounded that of the pine barrens.

When the country was first settled and before roads and clearings were made in the primeval forest, the early pioneers inhabited the country along the large streams notably the Delaware, where the alluvial soil was rich and productive. After all the available land along the river banks had been patented, the early settlers were forced to utilize the wilderness to the eastward. As the population became denser, it encroached more and more upon the land covered with the pitch pine, and as the soil of this region was less productive and in many cases poor, they began to look upon it as barren, hence the epithet pine barrens finally given to the region.

The region, outside of its botanic aspects, presents much of interest. A study of the names bestowed upon geographic features is profitable. A selection of the characteristic place names in the pine-barren region of New Jersey which are indicative of some local peculiarity is here made in part. The

white cedar tree has been used in designating a number of geographic features, as: Cedar Brook, Cedar Grove. Next to the cedar, the white oak has been used, as: White Oak Bottom, White Oak Branch, Indian names linger in Manahawken, Manumuskin. A number of geographic features are designated by well-known articles of human use. Such are Apple Pie Hill, Bread and Cheese Run, Breeches Branch, Cabin Branch, Calico, Featherbed Brook, One Hundred Dollar Bridge and some have a personal flavor, as Comical Corner, Double Trouble, Friendship Bogs, Good Luck, Hospitality Branch, Mary Ann Furnace, Mount Misery and the like. How much more applicable and appropriate these names are than those of exotic origin, such as: Chatsworth, Chesilhurst, Lakehurst, Penbryn, etc.

The influence of the geographic environment on the inhabitants of the region is best determined by a consideration of their local industries. Throughout the "pines," the sawmills, driven by water power, heralded the advent of permanent settlement. These mills were erected first in the period 1700–25. The pitch pine is the tree which gives character to the pine barrens of Southern New Jersey. It satisfied the needs of the early settlers for the sills and beams of buildings. As compared with modern logging, the methods of cutting and handling the logs in the forest were simple. Horse- and ox-teams sufficed to transport the logs to the sawmill, and the larger sizes were easily handled by one or two men. As the country was level and flat, no insuperable difficulties were presented in getting the logs out of the woods, especially if the lumbering was done when the ground was frozen or covered with snow. Pitch pine was used for various purposes, and the nearby forest supplied all the demands of that early day. Fat pine knots were used as a substitute for lamps and candles in the early days by splitting the knots into thin splints. Turpentine, rosin, tar and charcoal were obtained from the pitch pine tree. The white cedar of the swamps yielded a fine grade of lumber for cooperage (vats, tanks, churns, buckets and

firkins). Shingles were made of white cedar and these shingles covered many of the houses built in New Jersey in the last century.

An important industry of Southern New Jersey is the cultivation of the cranberry, for the fruit of which a large demand has developed in the United States. Between Philadelphia and Atlantic City, some of these cranberry bogs may be seen with the cranberry growing out of a peat and sphagnum substratum.

The soils of the pine-barren region are sandy with a gravelly subsoil, and the rate of percolation of water through the layers of soil from different localities shows that water passes through beach sand more quickly than pine-barren sand, and through pine-barren sands more rapidly than through soils covered with a deciduous forest, and this character of the soils corresponds with the geographic location of the three districts from which the soils are obtained. Experiments on the water-holding capacity of these types of soils shows that dune sand retains 33 per cent, the pine-barren soils 45 per cent, and other deciduous forest soils 56 per cent.

In a study of the pine-barren vegetation, we can recognize the following types: the pine forest proper, the cedar-swamp vegetation, the deciduous swamps, the savannas, the bogs and the plains. The pine, which makes up the bulk of the New Jersey pine forest, is the pitch pine, *Pinus rigida*. If we ascend a hill or other elevation, we see an unbroken extent of dark-green pine forest stretching off into the distance as far as the eye can reach. But a closer inspection shows considerable diversity of vegetation as we pass through the open sun-lit forest. In old stands of pine, the average height of the trees from ten to fourteen inches in diameter is sixty-five to seventy feet. Where fire has destroyed the original forest the pine trees are stunted, twenty to forty feet being an average height for such trees. The forest canopy consists of the dense crown of the standing pine trees, but only in exceptional cases do the crowns meet to shade the ground underneath. Considerable variation is found in the architectural forms of the pine trees

growing under different conditions of environment. There are conical, round-headed, bifurcated, candelabra-like, stag-headed trees in the pine-barren forest.

We can distinguish several types or facies of pine-barrens, such as wet pine-barrens, dry pine-barrens and high pine-barrens. There are pine-barren facies with bear oak (*Quercus nana*), with blackjack oak (*Quercus marylandica*) and with laurel (*Kalmia latifolia*) undergrowth. A common facies is where the heath-like plants are abundant, so that we have what the Germans call a pine heath (Kiefernheide). In other places we find very little undergrowth, but bare sand with prostrate trailing plants or with mosses and lichens. As illustrative of the pine-barren vegetation, we will describe the high pine-barren facies. The soil, being as a rule dry and well drained, is covered by a pine forest in which only the plants adapted to a dry soil are associated with the pines. The plants that are found in moist situations are entirely absent. The prevailing pine (*Pinus rigida*) forms an even stand, where the trees vary in height from twenty-five to forty feet. The canopy of this forest is fairly close, although there are intervals where the pines are more widely spaced. Associated with the pines are several dwarf oaks and the sassafras, while as the lower order of shrubby plants, we find sweet ferns, blueberries, huckleberries, sumachs, sand myrtle and sheep laurels. The taller herbs are goat's rue (*Tephrosia virginiana*), lupine (*Lupinus perennis*), wild indigo (*Baptisia tinctoria*) and several grasses. The plants of the forest floor are bearberry (*Arctostaphylos uva-ursi*), trailing arbutus, wintergreen and pyxie.

The seasonal aspects of the pine barrens are different from the deciduous forests west of Philadelphia, for we miss the familiar spring flowers, such as the wood anemone, spring beauties, bloodroot, rue anemones, violets and hepaticas, which flower before the leaves of the trees appear, but nevertheless we can distinguish a vernal aspect, an estival aspect and a serotinal aspect. The prevailing overhead color is the somber green of the pine trees, which meet in a continuous

mass of color formed by the serried columns of the tree trunks of a deep reddish brown. Early in the spring the light greens of the developing oak leaves enliven the monotonous ground colors, and an occasional sand myrtle is a rounded mass of white flowers. So that the color scheme is not without variation from season to season, especially in the autumn with the change in leaf colors and the appearance of golden-rods and showy asters.

A striking fact about the pine-barren region is that weeds are comparatively rare and recognized as such. They are chiefly found in the vicinity of the older and larger settlements, where the native vegetation has been damaged or destroyed by man. Spontaneous encroachment of introduced plants upon ground occupied by native plants is practically unknown, because of the fact that the pine-barren vegetation is a closed formation and of an exclusive type. The weeds are always the youngest element of a flora and their presence is bound up with the activity of man. This element of the flora may be called the "anthropophile" element and the species belonging to it as "anthropophytes." This anthropophile element may be divided into the "anthropochores," those plants which are not originally wild in the country, but which by man's activity were either purposely or unconsciously introduced, and the "apophytes," which were originally native in the country, but to some extent have abandoned their habitats and gone over to the cultivated areas.

The cedar swamps are an important part of the vegetation of South Jersey. The cedar trees form a noticeable feature of the landscape, growing in close stands with their spire-shaped tops pointing skyward. The white cedar trees (*Chamaecyparis thyoides*) are evergreen, and they grow so closely together that they form a dense shade in which only the most tolerant species of plants will grow. Cedar wood is valuable for shingles, firkins, buckets and vats, and the formerly abundant supplies have been rapidly depleted, so that the areas covered by standing trees are relatively few and far between. Three facts are

noteworthy about a cedar swamp. In the first place, a cedar growth is protective, as far as the movements of the air are concerned. It may be blowing a gale of wind outside, but inside a cedar grove it is calm and still, so that some deciduous trees hold their leaves until they are pushed off by the new ones of the spring. Secondly, a cedar swamp is cooler than the surrounding pine forest in summer, on account of the dense shade and the evaporation of moisture from the bog mosses that cover the ground. Thirdly, a cedar swamp is warmer in winter than the pine forest through which cold winds can blow uninterruptedly. Such a habitat cannot but be influential in the growth of various plants. From measurements that have been made of growing trees it has been determined that the cedar tree requires on an average about sixty years to reach a height of fifty feet and eighty years to reach a height of sixty feet. Valuation surveys show that at twenty years of age there are over 10,000 trees per acre, at forty years about 3,500 trees and at eighty years in one case over 1,000 trees. From accumulated data it follows: First, that it requires about sixty years to produce white cedar lumber in paying quantities; second, that it would pay to thin the forest when it is about forty to sixty years old. Associated with the white cedar and growing in its dense shade are red maple, magnolia, sour gum, laurel, clammy azalea, leather-leaf, sweet pepper-bush and high-bush blueberries. The laurel-leaved smilax, green-brier and poison ivy climb up the trees almost to their crown, while the pitcher plant and other herbaceous plants grow out of the quagmire cushions saturated with water, except in the driest seasons.

The successional history of the deciduous swamps may be looked for in the uninterrupted occupancy of stream depressions or valleys by an association of deciduous trees and shrubs that thrive in a wet or swampy soil, since the typical formation of the pine-barren region came to occupy the coastal plain of New Jersey. In some instances, a deciduous swamp has succeeded a cedar swamp after the removal of the cedar trees,

rain falls, and then the leaf structures, which control loss of water, become efficient. With the deep-rooted trees it is otherwise, for during the critical period of dry weather and the cold period of winter their deep-root systems enable them to get a supply of water from the subsoil. These considerations indicate that most of the pine-barren plants have adaptations for enduring drought, adaptations for evading drought and adaptations for escaping drought. Having determined the depth at which the subterranean organs of pine-barren plants are found, we can appreciate why this type of vegetation has been able to occupy Southern New Jersey, as a climax formation, since very early times. The roots are so matted and interlaced that few alien plants have a chance of becoming established. There is such an interrelation and reciprocity of underground plants that each plant has its roots at the soil level where they can best perform their functions and where they find space enough to grow. This adjustment of the root systems of pine-barren plants has taken ages to develop until an adjustment of root systems has been reached.

The foregoing survey of the vegetation of the pine-barrens of New Jersey presents some interesting facts about a vegetation, which, although related to that of the southern coastal plains, yet has many features that are entirely distinct. In no other region of North America does the pitch pine cover such a continuous stretch of country as in Central New Jersey. Secondly, the pine-barren vegetation of New Jersey is an old vegetation, in a long occupancy of the territory in which it is found. Thirdly, the pine-barren vegetation has maintained itself against the encroachment of other types of vegetation. Fourthly, nowhere in the coastal plain of the eastern United States is there such a large geographic area in a wild or pristine state. Fifthly, the future development of the region will be along several lines. Agriculture and horticulture will always remain the most important industries of the pine region. Thirty per cent of forest is necessary to preserve a proper balance between the forested areas and the land devoted to

agriculture, and stretches of forest must be preserved for the delectation of the future inhabitants of the state, while local centers will be devoted to manufacture. Such will be the probable future of this part of the State of New Jersey.

Lastly, before reaching Atlantic City, we cross wide stretches of open salt marsh intersected by channels, where the salt water, influenced by the tides, flows in and out. The vegetation of the salt marshes is composed of salt-loving plants and the reclamation of salt-marsh soils will be accomplished by the building of dykes and by drainage. Already the population of the salt-marsh region is segregated from that of the pine-barrens, and the future agriculture will be of a different sort. Such are some of the points which a study of the vegetation between Philadelphia and Atlantic City makes of interest to the non-botanic public.

THE CONSERVATION OF THE PUBLIC HEALTH

By A. C. Abbott

Professor of Hygiene and Bacteriology and Director of the Laboratory of Hygiene, University of Pennsylvania

Among the movements for the conservation of natural resources none is of more importance and in none is activity more manifest than in that having to do with the public health. The health of the people as a national asset has ever been recognized, and in all available accounts of early civilizations evidence is encountered of efforts toward its conservation in one way or another. Among the laws of Moses for the guidance of his people is a sanitary code that in most respects could well be followed today.

It is not my purpose in this lecture to cite the conditions of ancient times, but rather of those existing in the nineteenth century; to point out the crying needs for reform in so far as control of those conditions was concerned; to contrast the activities of today with those of but a few years ago and to insist that real reform is made possible through only two agencies—increased knowledge and enlightened public opinion.

In so far as modern conditions are concerned, the real movement for reform and conservation began in England at about the middle of the last century, at a period commonly denominated "the era of sanitary reform."

To realize that such reform was needed one has but to consult the writings of the times—particularly those bearing upon the manifold social, economic and political conditions then in existence. Abuses of all kinds were everywhere in evidence. Extraordinary malpractices in schools, tenements, prisons and asylums were exposed by contemporary novelists, especially by Dickens and by Reade. The Poor Commission had revealed conditions among the lower classes that they denounced as "disgraceful to a Christian land."

It was not until between 1836 and 1840 that any exact idea of the enormous waste from preventable deaths could be formed. Prior to that time the only available records were those usually kept by the churches. In 1834 systematic vital statistical records were begun, and they were not long in exposing so alarming a death rate that parliament was forced to act in an effort to correct the underlying evils.

As a matter of self-protection many of the better classes began to protest loudly against the squalor, filth, overcrowding and disease in the quarters occupied by the poor; while a few were equally insistent that parliament should not legislate for the sanitary control of sewerage, cesspools, graveyards, bad water, general filth and overcrowding, as through the operations of these factors those less fit to survive would be eliminated.

The revelations made by Sir John Simon at and about 1850 showed the conditions in the city of London to be in many respects scarcely better than those common to the Middle Ages, and the accounts given to parliament by the several commissions deputed to report on the conditions existing throughout England depicted in general a state of affairs far from consistent with civilized life.

Writing upon the sanitary conditions of London, preliminary to his campaign for legislation that ultimately forced a reform of conditions, Sir John Simon declares, "That national prevalence of sanitary neglect is a very grievous fact, and though I pretend to no official concern in anything beyond the city boundaries, I cannot forego the present opportunity of saying a few words to bespeak for it the reader's attention. I would beg any educated person to consider what are the conditions in which alone animal life can thrive, to learn, by personal inspection, how far these conditions are realized for the masses of our population, and to form for himself a conscientious judgment as to the need for great, if even almost revolutionary, reforms. Let any such person devote an hour to visiting some very poor neighborhood in the metropolis or in almost any of the larger

towns. Let him breathe its air, taste its water, eat its bread. Let him think of human life struggling with these for years. Let him fancy what it would be to himself to live there, in that beastly degradation of stink, fed with such bread, drinking such water. Let him enter some house there at hazard, and—heeding where he treads—follow the guidance of his outraged nose to the yard (if there be one) or to the cellar. Let him talk to the inmates; let him hear what is thought of the bone boiler next door, or the slaughter-house behind; what of the sewer grating before the door; what of the basketmakers upstairs, twelve in a room, who came in after the hopping and got the fever; what of the artizan's dead body stretched on his widow's one bed, beside her living children."

Among the several reports of the Health of Towns Commissioners are found so many examples of absolute lack of sanitary provisions as to lead to the suspicion that such was the rule rather than the exception. For instance, in referring to the lack of provisions for so essential a matter as the decent disposal of human waste, as observed in many English towns as late as 1861, the commissioners make the following comment and citations: "In the primitive condition of society no consideration was given to these matters, and no special place allotted at all for such purpose and, of course, the result was that excrement was disposed of in any convenient or inconvenient locality, and we have to allude to such a primitive condition of things because it is not confined to some distant period, or to what we are pleased to call barbarian countries, but exists today in many of our own towns."

The public highways were used as late as 1864 not only for the deposition of garbage, house sewage and all manner of waste, but were likewise regarded as the appropriate places for all purposes of personal easement.

In the ninth report it is stated that "until comparatively lately (1854) houses under ten-pound rental were not provided with privies or cesspools, the inhabitants using the open streets instead."

In 1844 about 20,000 of the population of Liverpool lived in cellars and were "absolutely without any places of deposit for refuse matter."

The Superintendent of Nuisances of Manchester reports that "in 1845 there were 645 houses with families of 11 persons on an average, making an aggregate of 7,095 persons having only 33 petties (necessaries) for their convenience, which, as might be supposed, are generally in a most disgusting and filthy state.

These citations taken at random from Mr. Corfield's compilation suffice to illustrate some of the conditions of life in the good old times in merry England, and I have a strong suspicion that they were not peculiar to that country nor to that time. Moreover, a further perusal of the reports brings out the astounding fact that these practices were not restricted to a few houses or neighborhoods in special centers of population, but were general and customary.

Appreciating fully the significance of all this ignorance, squalor, filth and lack of power on the part of officials to correct the evils, is it astounding that thoughtful citizens were in constant fear of an invasion of epidemic diseases? It was fear of cholera that led to the movement for reform in England. It is well for the world that something was sufficiently menacing to bring it about, and particularly fortunate that such intellectually vigorous men as Sir John Simon, Sir Edward Chadwick and Dr. William Farr were conspicuous in impressing the necessity for it. But it was no easy task. "Last winter," writes Sir John Simon in 1854, "when the signs of the times were making us fear that cholera would presently again be epidemic in London, it was remembered that, in the greatest part of the metropolis nothing whatever had been done since the last invasion to give immunity against the returning disease."

However, after about two years of hard fighting, the principle was finally established: that the state is responsible for the health of its inhabitants, and that it is obligated to formulate

health laws and see that sanitary regulations are enforced throughout its entire area.

Such care of contagious diseases as was evident then was in accordance with the knowledge of the time; that is to say, beyond confining the diseased individual to lazarettos—usually another name for pest houses of the vilest description—nothing was done. Not all infective or transmissible diseases were so treated; only those known to be highly contagious or "pestilential" as then commonly denominated. Among the mass of people, pestilences were still fatalistically regarded as visitations of the Almighty, to resist which would be of no avail. Under such circumstances is it astounding that little or nothing was or could be accomplished in the way of checking epidemics?

Nothing was known of disinfection or disinfectants. Where efforts were made to destroy contagion it was usually through the burning of a little sulphur as a fumigant or through the pollution of the air by evil-smelling aromatics supposed to be destructive to the morbific agents having to do with the infection. It is needless to say that not any of these practices were effective, and there were no trustworthy scientific means of deciding this point.

There was no exact knowledge whatever of the causative factors of infective disease until about 1880, and prior to that time opinions expressed upon this fundamentally important subject were scarcely more than guess work. For instance, the then ubiquitous malarial fever was due to a miasm; that is, an atmospheric something arising from marshy land. Writing in 1858, Dr. James Pickford gives it as one of the functions of atmospheric ozone to "decompose or destroy malaria given off from the earth surface." He further states that the noxious vapors of night air render "sleeping with open windows particularly dangerous." That opinion, very generally held at the time may in part explain what was meant by a subsequent writer who gives as the reason for the delicious purity of country air "that country people always sleep with their windows closed."

Typhoid fever, up to a short time before the period under consideration, was hopelessly confused with typhus fever, and it was not until the conclusive studies of Dr. Gerhard, of Philadelphia, had demonstrated (about 1836) the two diseases to be distinct that we began to get some real information concerning both of them. But the cause of typhus fever is still unknown, and that of typhoid fever was not discovered until between 1880 and 1884. Prior to that time one or both were thought to result from seasonal influences, filth, overcrowding, the decomposition of vegetable matter and sewer gas. And it is probable that the single expression "the fever" so often encountered in the writings of that time referred to one of these maladies or possibly to malarial fever.

Tuberculosis—consumption or pulmonary phthisis, as it was more generally called—was regarded as a family malady surely transmitted by heredity.

Pneumonia was the result of catching cold, and because of occasional house outbreaks and prison outbreaks, was thought by a few to be contagious.

Diphtheria was known to be highly contagious, but through what agencies it was not known.

The evolution of our knowledge of this disease, originally designated "putrid sore throat," constitutes one of the most interesting and, from the sanitary standpoint, influential chapters in the history of medicine. Years were spent in discussion, sometimes amounting to bitter polemic, as to whether diphtheria is primarily a constitutional disease with a local manifestation or a local disease with constitutional manifestations. More years were spent in hot controversy over the true character and diagnostic value of the membrane in the throat; then came the equally warm debate upon the relation between this disease, and what was formerly known as membranous croup. All to no avail, as it was impossible with existing knowledge to decide either of the points. In the meantime an appalling waste of life was resulting from the endemic and epidemic activities of this malady. In 1844 this whole matter

received a flood of light through the discovery of the exciting parasite of the disease, and in a comparatively short time each and every one of the obscure points were clarified to the general satisfaction, and the control of the ravages of the disease was soon to follow, as will be shown later.

Tetanus or lockjaw was generally attributed to seasonal, climatic and geologic influences.

Yellow fever, until a few years ago, was believed by many, though not by all, to be highly contagious and, like malarial fever, to be miasmatic in origin.

Such information as existed at the times of which we write was strictly the property of the medical profession; there was no desire to disseminate it, and had the desire existed, there were no effective means of so doing.

These random citations serve to illustrate the general physical conditions and the state of our medical knowledge prior to about the beginning of the last quarter of the nineteenth century. They serve as a useful background with which to compare the marvelous growth of information in the years following, and to make evident the forces that have been operative in the evolution of our systematic efforts toward the conservation of health.

It was the work of von Pettenkofer in Munich, of Pasteur in France, and Koch in Germany that laid the foundation stones on which was to be erected the modern structure of sanitary science.

As the result of the work of these pioneers, using trustworthy physical, chemical and biological methods of inquiry, the mystery that had hitherto surrounded the origin and spread of endemic and epidemic diseases disappeared; the importance of unsanitary surroundings in favoring the spread of disease was explained; much light was thrown upon important matters of personal hygiene and comfort, and through the labors, especially of Pasteur and of Koch, with their numerous disciples, the exciting causative factors of many of our serious infective diseases were revealed and found to be living entities whose

peculiarities could readily be determined outside the body under conditions of artificial cultivation. This led to the search for trustworthy means of combating and destroying such living parasites, with the result that disinfection was promptly placed upon a firm scientific basis.

The ancient, well-known and puzzling fact that many of both animals and human beings after recovery from infective diseases are immune from subsequent attacks, offered a tempting problem for the application of our new knowledge and methods of inquiry. It engaged the attention of the ablest investigators, and the results of their labors have fully justified the effort. We are today in possession of such information upon the mechanism of infection, immunity and epidemology as will in the not far distant future make it a comparatively simple matter to eliminate endemic and prevent the spread of epidemic diseases. That this is no idle dream we have but to review some of that which has already been accomplished, notably the marvelous results of the correct use of diphtheria antitoxin in both the prevention and cure of diphtheria; the practical elimination of typhoid fever from among all who submit to protective inoculation against it; the striking lessening of cholera in its endemic home through the analogous prophylactic procedure; the saving of life through the treatment of cerebro-spinal meningitis with its specific antiserum, and the prevention of fatalities, even the development of the disease, among those bitten by rabid animals through the use of a specific agent. The principles that are involved in the success of these methods are probably susceptible of wider application, and with the growth of public confidence in the sincerity of the efforts to lessen suffering and prevent death, I have no doubt that this field of activity will be greatly extended.*

These remarkable additions to our knowledge of disease are calculated to fascinate not only those professionally concerned with medical matters, but also the intelligent layman who is

* It is proper to say in passing, that not a single step in this splendid march of progress could have been taken without the use of living animals for experimental purposes.

fully appreciative of what these discoveries mean to him. The activity shown in giving wide publicity to this knowledge has evolved a public keenly interested in its utilization. It is not surprising, therefore, that the layman, individually and collectively, is beginning to busy himself with these affairs, nor that he is inquisitive concerning such matters, as well as insistent that those responsible for the health of the public shall employ them for his good in an effective way. All this has resulted in a very different attitude on the part of our official bodies responsible for the public health. Formerly their problem was relatively simple, due, in the main, to lack of trustworthy information. Their functions were principally concerned with maritime quarantine, the abatement of obvious nuisances, the control of epidemic diseases after they had become of sufficient gravity to attract attention, and such records of deaths and births as might be gathered in an unsystematic manner, ofttimes from unofficial sources. Within a comparatively brief space of time our health boards have undergone a remarkable evolution. They have acquired a totally new conception of their responsibilities, functions, powers and public backing, and they realize that available knowledge not only makes for effective work in the direction of lessening disease and of improving conditions of life, but leaves them without an adequate excuse for evading this responsibility.

I know of no better way to bring before you that which is meant by the expression "conservation of the public health" than by citing the ideals and manifold activities of those bodies that are today held responsible for such conservation, and allowing you to contrast them with the limitations that characterized the work which was done or conceived at a time that is within the recollection of most of us.

Picture to yourselves, in addition to the foregoing citations of general unsanitary conditions, this state of affairs: Ignorance of the causes of communicable diseases and the way in which they are spread, and no means of securing exact information; utterly inadequate records of diseases and deaths; insufficient

information upon the parts played by water, air, food, etc., in the causation of sickness; total inertia upon the question of accidents and diseases peculiar to occupation; equal indifference to the appalling mortality among infants; a widespread contentment with the opinion that certain diseases are peculiar to families and must be borne as an inevitable heritage; such reticence in the discussion of venereal diseases as to make progress toward their diminution impossible; no public opinion based upon widely distributed information on any of the phases of public health work and, above all, that the only qualifications requisite for those responsible for the public health were some knowledge of medicine and much political influence.

One should not exclaim at the foregoing recital. It depicts conditions that were probably as good as available scientific information and public opinion could make them, and one must not conclude that the aims of those engaged in the work were necessarily open to criticism. The majority of our health boards of twenty-five years ago comprised men of the highest integrity and best motives; they did all they could with such knowledge and public backing as they could secure. Some of our soundest legislation for health, comfort and decency dates from periods long before the "era of sanitary reform"—for instance, the General Nuisance Law for the city of Philadelphia, indispensable for the needs of today, bears the date 1818. Nevertheless, if we view the daily routine of health protective work as done at the times of which we write, keeping in mind the very great lack of information on many fundamentally important features of the work, we cannot avoid the suspicion that nature, while often ruthless in her destruction, has frequently means of her own for terminating, unaided, such destruction when it suits her plans to do so.

Of all the factors responsible for the newer order of things, two stand out pre-eminently; namely, the discoveries from the application of trustworthy scientific methods to the study of disease and the persistent dissemination of this information throughout the non-medical parts of our communities. In

illustration let me cite a conspicuous result of this combination: Diphtheria had been known as a definite disease entity for about a century before its existing cause was discovered. This discovery was quickly followed by the discovery of its specific curative agent. When the fact became known throughout the lay world that a harmless agent, acting almost like magic in curing this dread disease had been discovered, is it at all surprising that the world at large was interested? At that psychological moment certain wise men proposed an expenditure of public funds for the establishment of laboratories designed for the prompt diagnosis of diphtheria and for the manufacture of its specific curative agent. Public opinion was so strongly in favor that almost at once fully equipped laboratories, presided over by trained experts, were placed at the disposal of the majority of our health boards in larger cities.

Just as soon as such laboratories were founded, their usefulness in other directions became at once manifest. It was now possible to determine with certainty the value of methods and substances hitherto used more or less empirically for the destruction of contagious matters. It became possible to surround with some degree of scientific control such important questions as those relating to the character of water used for domestic purposes, the fitness of milk for human consumption, the infectivity or harmlessness of other animal products used as food and, in many ways, through the laboratory activities, the correct diagnosis and prompt reporting of dangerous epidemic diseases was facilitated. As a result of all this the public health laboratory is a permanent, indispensable part of our official equipment for combating disease.

In the early nineties it was realized that, as the common contagious diseases are peculiar to early life, the time and place to detect the danger arising from them in its incipiency is when the children of our larger communities are gathered together for study. This led to the development of medical school inspection, at first tentative, voluntary, experimental and in the main directed only to the transmissible diseases. Immediately,

however, many children were discovered with defective vision, hearing, mentality and structure. These conditions were made known to a sympathetic audience now accustomed, through information presented to them by newspapers and magazines, to being informed. The result is that, through public approval, almost insistence, the child in school that is in any way defective may receive such relief as its condition demands. Of course, the cry of "paternalism" was heard from time to time, but this is easily met. If it be logical for public opinion to insist that every child be compelled to take an education, it is equally logical for the public, at the public expense, to place the child in a position to receive the education if the necessary aid cannot be secured through other channels.

The results of medical inspection of school children and of schools in lessening the incidence of transmissible diseases cannot be stated numerically, but from personal study of the subject I am convinced that everywhere that the system is in proper operation, it is a most important factor in striking at the very root of epidemic outbreaks of the diseases common to childhood. Over and above this, its educational value on child, teacher and parent constitutes an influence for good that should not be underestimated.

Information acquired through the inspection of school children, together with that resulting from careful surveys of the general conditions surrounding the children of the poor in our great centers of population, has resulted in the organization of "divisions" in our progressive health organizations whose functions are restricted to the hygiene of infancy and childhood. The need for such effort is evident when we remember that of 1,000 children born there die during the first year of life, in our cities of average composition, from 150 to 200 annually and that, throughout our communities in general, from 45 to 50 per 1,000 die before reaching five years of age. In spite of this condition, which is now, in general, better than was formerly the case, New York City, offering one of the most difficult of problems in this particular, has, by unremitting, intelligent effort, cut the

mortality rate of infants under one year of age from 244 to 102 per 1,000 in the space of twenty-six years. What has been done in that city can be done elsewhere by corresponding energy and expenditure of money.

The campaign for the hygiene of infancy and childhood is essentially one of education. An ignorant mother, be her circumstances what they may, is as incapable of properly caring for an infant as is an incompetent mechanic to run a delicately constructed piece of machinery. If we add to ignorance, destitution and all that it entails, we begin to realize the princiapl factors in the appalling death rate common to the age of infancy. The lessening of this waste of life is a new function of our conservation activities. It should be an attractive field to those who will permit themselves to become actively interested, for results are certain.

As accurate vital statistics afford the only reliable guides by which the value of safeguards can be estimated, it is not surprising that this phase of the work was among the first to receive careful consideration. When the movement for sanitary reform was once well under way, it became obvious that the official records were of but little value in affording trustworthy data either as to the rates of births and deaths or as to the occurrence and location of diseases that might jeopardize the public health. From the pioneer efforts of Dr. Farr, of England, the whole system, or lack of system rather, that had been in operation was recast, with the result that there has evolved in Great Britain and in the countries of Western Europe systematic methods of record keeping that leave little to be desired. We have been tardy in this country in this particular, but it is safe to predict that the efforts which are being put forth by our Federal government and by many of the states of the Union bid fair to give us in the near future statistical data that will be trustworthy and fully competent to meet all requirements. It may be of interest for you to know that up to about 1905 there were many parts of this state in which a human being could die and be buried without any official record at all having

been made of the occurrence, a condition probably common to many localities other than Pennsylvania. This is now all changed, and an efficient Department of Vital Statistics is taken for granted as an essential integral part of all official organizations responsible for the public health.

The advances in knowledge of transmissible disease, including the causes of many, their modes of transmission, the portals through which infection may occur, and the approved means for their isolation and prevention, have forced upon those interested in this phase of our conservation movement responsibilities that cannot be evaded. Our new knowledge justifies the dictum that all diseases that are transmissible are to a large extent preventable. We know that no transmission occurs through mysterious and elusive agents, but that certainly in most, and probably in all cases, it is the result of particulate living substances being carried in manifold ways from the sick to the well. The importance of this fact is obvious, but its utilization to a particular end means the activities of specially trained men having a very different mental attitude to their problem than that formerly possible. Of all the functions of the many who are concerned in our modern movement for conservation, probably none are being more constantly and vigilantly exercised. Though the end has not by any means been reached, still such results as have been obtained, when contrasted with those of former times, leave no doubt as to the ultimate value of the efforts in reducing transmissible diseases to a point far lower than that now shown by our records.

As our acquaintance with this field of activity becomes more and more intimate, it is obvious that certain prevailing customs might be modified with advantage to the public. The annoyance, difficulty and, often, impossibility of surrounding acute contagious diseases in private dwellings with such safeguards as will fully protect the community from their spread, led me to think it probable that in the future the majority of contagious diseases will be cared for in hospitals. Not pest houses, in the former sense, located far away from centers of population and so

constructed and conducted as to make them a disgrace to the community supporting them, but hospitals of modern type, presided over by competent experts, so located as to be within easy access of the populous centers or, indeed, in the midst of such centers and conducted under such discipline and technique that the friends or relations of patients confined within them may have access as visitors without the fear of conveying infection to the outside world. Many of our former ideas of such hospitals have undergone radical revision. They are not to be viewed as places for the incarceration of misdemeanants, but rather for the care of unfortunate victims of disease. They can and must be conducted in a manner that will exclude the likelihood of their menacing the surrounding neighborhood, and to do this they demand the services of the best type of trained experts in their manifold departments of work.

In the campaign against tuberculosis nothing is more essential than hospitals for the segregation of advanced cases occurring among the ignorant and destitute. In every city are hundreds of such cases serving as foci for the dissemination of the disease. They receive no care, they are not acceptable to general hospitals and, being poor and ignorant, many are left to their own devices, with results that must be manifest to you all.

By taking advantage of all available sanitary knowledge it has been demonstrated that typhoid fever, one of the most ubiquitous of transmissible diseases, may be pushed almost to the vanishing point from centers in which a few years ago it existed to a disgraceful degree of endemicity.

Diphtheria, of which we know probably more than of any of the other dangerous epidemic diseases, has lost its former terrors. The intelligent use of modern methods has demonstrated our ability to restrict its spread and even to rescue the lives of the majority for whom the infection would otherwise have proved fatal.

Typhus fever, scurvy and dysentery, formerly commonly seen in our jails, asylums and, sometimes, in our hospitals,

have become medical curiosities, simply as the result of the enforcement of sanitary rules.

The epidemic occurrence of smallpox is absolutely within our control, providing the community in which we are working is receptive to logical argument.

The contagious diseases of children are no longer viewed with indifference, and their occurrence taken as a matter of course. It is believed that they should be limited. It is believed that their spread can be checked, and it is known that the only way to accomplish this result is with the intelligent co-operation of an informed medical and lay public. As information upon all these matters becomes more and more public property, two results are seen: a willingness to co-operate, because scientific efforts are now understood, and an insistence that such co-operation shall be with officials specially trained in the control of epidemic diseases; that is to say, experts whose opinions carry authority and men in whom the public can feel the fullest confidence.

Of no less interest is the fact that some of the conspicuous conditions responsible for the sanitary reform of the middle of the last century are again (or still) with us as concomitants of modern life. They demand immediate and serious attention. I have in mind the housing of the poor and the diseases of occupation. I shall not take your time with a discussion of the various phases through which the housing question has passed, nor will I dilate on the relations between overcrowding, filth, destitution, etc., upon the occurrence of disease. It suffices to say that among students of this subject there is no disagreement of opinion that they are related to one and another as cause and effect. But aside from the direct or the predisposing relationship of these conditions to disease, there is another consideration that cannot be ignored in our campaign for health. In every large center of population there are today hundreds existing under such conditions of destitution and insanitation as to justify the question: Is such life worth the living? Remember if you please that these are human beings,

with human rights, whom we are trying to educate and develop to the responsibility of citizenship. These ends can be met only through such revelation of the better sides and conditions of life as will demonstrate that life does hold much that is worth the effort. With the accomplishment of this comes a demand for increased knowledge, and education results. With education comes the understanding that makes for co-operation in all efforts for the public weal, be they for health or otherwise. It may be said that the housing of the poor is not a function of public health organizations. The housing of the poor is a very important health function when such housing constitutes nuisances admittedly prejudicial to both the individual and the public health, as much of it can readily be so declared. Fortunately for most of our large communities, no time is lost in deciding that question. The splendid support given to competent health officials by numerous philanthropically inclined individuals and associations has rapidly led to at least some degree of amelioration of conditions and this too without unpleasant squabbling as to who shall have the credit for it.

With the extraordinary development of modern industries there has evolved a problem, not new in kind, but new in magnitude—namely, that having to do with diseases incidental to occupation. Twenty years ago Dr. Ogle, in writing upon the influence of congestion of population and of occupation upon disease, stated: "The more crowded a community the greater, speaking generally, is the amount of abject want, of filth, of crime, of drunkenness and of other excesses; the more keen the competition, the more feverish and exacting the conditions of life; moreover, and perhaps more than all, it is in these crowded communities that almost all of the dangerous and unhealthy industries are carried on. It is not so much the aggregation itself as those other factors which are associated with aggregation that produce the high mortality of our great towns and other thickly populated areas." That is a fair and accurate estimation of conditions when escape by the workmen and his family are impossible, Fortunately, cheap and rapid transportation and

the construction of low-priced modern dwellings located away from the centers of industry, as is seen in and about many manufacturing towns of this and other countries, have been operative in changing to some extent the conditions cited by Dr. Ogle. But there still remain the diseases peculiar to this and that trade, and the accidents common to most trades. America has not been conspicuously active in this field. The socialistic movements of Europe and Great Britain, together with the manifest economic advantages of workmen in good health, have forced the matter to the fore as an existing but preventable evil. This phase of the work has not to my knowledge been taken up in a conspicuous way by any of our official health organizations. It is a fertile field and one worth the best effort. Interest in the subject is growing, and doubtless a generation hence we shall find with increased knowledge such a degree of sanitary control of the conditions of occupation as may fairly be expected to safeguard the health of the workman.

In the matter of child labor, there is opportunity for important health supervision. It is not my intention to discuss the social, ethical or economic sides of this question, but surely it should be a function of someone in authority to determine the physical fitness of the individual child, be the age what it may, for the work it is trying to do, and to control the sanitary conditions surrounding such labor.

The extraordinary growth of urban population, the feverish competition, the growing demand upon producers of food stuffs and the efforts to meet those demands have evolved a problem new in magnitude, if not in kind, namely, an official control of foods and drugs. Judging by existing conditions, I do not believe the public realizes either the size, the complexity or the importance of this problem. Its solution depends upon the co-ordinated activities of Federal, state and local governments, backed by intelligent public opinion. It is beset with a host of difficulties more or less equally divided between those of the sanitary, those of æsthetic and those of an economic

nature. Avoiding tiresome details it comprehends the control of the killing of animals, the flesh of which is to be used by man as food; the sanitary control of that most perishable commodity and potentially dangerous food, milk; the supervision of the use of various methods employed in preserving and storing foods with a view of eliminating those that are harmful; a routine inspection of the multiplicity of foodstuffs that lend themselves to adulteration, and a rational standardization of drugs used for the treatment of the sick. This work has, as you know, been begun. The need for it was fully recognized more than a half century ago. We have not reached a point when the last word can be said as to what the limitations of regulations shall be, but we are sufficiently along to justify the prediction that the problem will ultimately be solved in a manner that will safeguard health without seriously violating the equity of either producer or consumer.

If, twenty-five years ago, one had predicted that the problem of protecting health would in the near future assume a character demanding the services of the engineer, the entomologist, the veterinarian and the economic zoologist, one would certainly have been declared, by most of his hearers, a little mad. Yet such has come to pass. Witness the elaborate and scientifically approved methods for the disposal of municipal waste, both solid and fluid—all the outcome of co-ordinate investigations by the engineer and the biologist; follow from their crude beginnings to their present evolution efforts to supply large communities with wholesome drinking water and think for a moment what this has accomplished in the improvement of health wherever advantage has been taken of existing knowledge on the subject. This, too, is the accumulated result of work by both engineer and biologist. Contemplate for a moment the relationship between the health of the public and that of the variety of domestic animals used as food. The economic and health importance of this subject is such as to warrant liberal, almost prodigal expenditures in securing all light possible on so vital a question. Much that has been done in

this field by the veterinarian and the economic zoologist has been of direct application to problems of preventive medicine. In particular localities our new knowledge not only suggests, but actually demands, the extermination of rodents and of insects and their breeding places as the most important function of those endeavoring to protect health. The construction of the Panama Canal, great as that accomplishment is from an engineering standpoint, was made possible only through our knowledge of the rôle of mosquitos in causing the spread of malarial and yellow fevers. The failure of the French was due to lack of that knowledge. Long before the canal was begun by American enterprise, Ross had demonstrated that malarial fever was exclusively a mosquito-born infection, and shortly before it was begun that small band of American heroes, with the late Major Walter Reed, of the U. S. Army Medical Corps at its head, had shown that the dread yellow fever of our American tropics are likewise dependent upon the activities of mosquitos for its origin and spread, and with the elimination of the mosquito, the disease would be eliminated. These facts, together with Theobold Smith's work on the protozoal infection of cattle, known as Texas fever; the revelation that the fly is an active carrier of typhoid fever and other infections; that relapsing fever is carried by a tick; that the important agent in the dissemination of bubonic plague is the rat flea; that sleeping sickness is due to the bite of an infected fly, and that certain rodents, notably mice, rats and ground squirrels, are subject to a number of infections common to man, have demanded a knowledge on the part of our officials both of the life and habits of insects as well as of the small animals that may serve as carriers of disease.

The importance of these revelations to our problem of health conservation is fully established through trustworthy modern investigations, their significance cannot be ignored and the elimination of the conditions so obviously demands the services of specially trained men as to make argument on that point entirely unnecessary.

In addition to the foregoing, which, I hope, may give some idea of this many-sided problem of health conservation, additional activities are being suggested by newer conditions and conceptions. For instance, the public is evidencing a willingness to face and discuss a problem hitherto taboo, namely, that of venereal diseases. That which had been known only to the medical profession for years is to some extent now the property of the layman, and a widespread interest in the movement to check the ravages of this group of infections is well established.

To those professionally concerned in public health work, it seems that some sort of federal control should be exercised over many of our interstate water courses on which more or less widely separated communities depend for their water supply; similarly, for the purposes of the federal census of births, deaths, incidence and distribution of disease, it would seem advisable not to wait longer for the co-operation of tardy states in this important matter, but for the federal authorities to at once assume such general control as will give trustworthy statistical data for the entire country; similarly, that the epidemic presence of many diseases is not a local or state matter, to be considered or ignored as the case may be, but is ofttimes a truly interstate question that should be dealt with from a centralized, authoritative source. The desirability of conservative education of school children upon many questions of personal and public hygiene is under consideration. The perennial question relating to regulation of maritime quarantine is about due. And not of the least importance are the problems that will arise after the union of the two oceans; problems involving the introduction of strange, exotic diseases from remote parts of the world, and of harmful parasites not now known to our land.

It is obvious if we conceive all these to be appropriate functions of official health organizations that much greater provisions, both financial and expert, shall have to be made in the future than has been the case in the past. Some of the activities here alluded to may properly be regarded as without the scope of a

health board, but they certainly cannot be regarded as without the scope of an organized effort to conserve health. Fortunately, the general interest shown by many of our citizens in this important field of activity has resulted in the organization of unofficial associations who, while in no way responsible for the administration of affairs, are still co-operating in a highly effective manner with those who are. The outcome of such co-operation and mutual support is a much broader and intelligent interest, and much more effective and progressive campaign than would otherwise be possible.

As I have endeavored to intimate, the real progress in conserving health, and lessening disease, has been observed during about the last thirty years, that is to say, the period in which scientific knowledge on the subject has been fairly satisfactory, though far from complete, and public opinion is being trained to appreciate that a "nation's health is a nation's wealth." Probably no more concrete illustration of this advance can be offered than the decline in the general death rates noted in several of our widely separated largest centers of population. In the past thirty years the death rate of "London has fallen from 20.9 to 14.0 per 1,000 of population; that of Paris from 24.4 to 17.5; that of Vienna from 28.2 to 17, and that of New York City from 27.5 to 17." [Quoted from "The Significance of a Declining Death Rate," by Frederick L. Hoffman, LL.D., Statistician of the Prudential Life Insurance Company.]

These rather sketchy outlines may, I trust, present the modern conceptions in contrast with those of only a few years back. The millennium has not, however, been reached. Such far-reaching plans of campaign are not everywhere in evidence. In the activities of our Federal, and some of our State and city governments, the interdependent social and sanitary aspects of the subject are being intelligently and comprehensively considered, and such progress in the rectification of things is being made as the complexities of the problem will admit. But continued progress depends largely upon two factors: More money for public health work and trained experts to direct

the work. As someone has said, and I think correctly, public health is purchasable just as in any other commodity, providing we know definitely what we want and have the money to pay for it. The public is awakening to the necessity of special training for those engaged in this field of endeavor and the ramifications of the problem fully demonstrate the incapacity of the ordinary practicing physician for effective service. The public health question is as much a matter of special training for the medical or layman, as are any of the other special fields of medicine or science. In support of this opinion we find a number of our leading universities offering courses of instruction definitely designed for the needs of those hoping to make a career in public preventive medicine, in sanitary science or in sanitary engineering. It cannot as yet be said that there is a conspicuous demand for such instruction nor will there be until the public assumes a somewhat different attitude than that at present observable. If the services of competently trained men are to be secured, it must be remembered that time, energy and money have been expended in securing such competency, and that the professional activities of such men are worth much more than the compensations ordinarily given. The position should be such as to attract the highest type of trained sanitarian; the compensation sufficient in amount to justify the demand that his entire time and efforts be devoted to the work for which he is employed; and the tenure of office dependent solely upon the excellence of services rendered and in no way upon the vagaries of political whim.

THE CONTROL OF TRUSTS FROM A LEGAL POINT OF VIEW

By William Draper Lewis

Professor of Law and Former Dean of the Law School, University of Pennsylvania

Monopoly implies something that is not good. It is a word with a bad taste. The instinct of the average person is that those who have a monopoly have something which they ought not to have. This instinct is partly the result of inheritance, partly the result of experience. As a people we have been fighting monopoly for many hundreds of years, and are still fighting. Successfully combated in one form, changing economic conditions make possible its appearance in another.

Monopoly implies control of a product or service. Its exact definition is impossible. The amount of any given kind of control which must exist cannot be stated with precision, and control itself is a condition which may result from an infinite number of combinations of factors. But though definition in the sense of that term in what are properly called the exact sciences cannot be had for the concepts of economic science, it is possible to analyze and classify the factors on which monopolistic control rests and to indicate the kind of control which constitutes monopoly.

Monopolistic power over production or service may be based on any one of five wholly different factors: Public grants, contracts and combinations, the possession of all the available supply, unfair trade practices, and lastly the possession of an economic factor essential to production.

Monopolies based on grants from the Crown were those which the English people were first called upon to combat, and therefore they are the first with which our judges and lawyers had to do. The Plantagenet Kings assumed the right

to exercise the power of commercial police: to regulate coins, weights, measures; to appoint fairs and markets; and as patrons of industry, to encourage the introduction of manufacturers from abroad by giving exclusive privileges to those who would consent to introduce new trades. One of the earliest recorded grants of this kind is that made in 1332 by Edward II to one John Kemble, a native of Flanders, of the sole right to set up the industry of cloth making in England. Had the English sovereign confined such grants to those who established a new industry or made a useful invention or discovery, it is probable that their legality might never have been successfully disputed. But monopolistic rights granted perhaps originally for a good public object, soon began to be treated as a source of revenue to the Crown. It was not, however, until the reign of Queen Elizabeth that the evil consequences of such grants became unbearable. That sovereign, rich in subjects distinguished in civil and military affairs, but poor in pocket to reward them, granted them monopolies which they could sell or exchange to their profit. These monopolies created by royal grant, or patent as it was called, included among a large number of other commodities: "Currants, salt, iron, powder, cards, calfskins, fells, pouldavies, ox shinbones, train oil, list of cloth, potashes, anise-seeds, vinegar, seacoal, steel, aquavitae, brushes, pots, bottles, salt-petre, lead, accidences, oil, calamine stone, oil of blubber, glasses, paper, starch, tin, sulphur, new draper, dried pilchards, transportation of iron ordnance, of beer, of horn, of leather, importation of Spanish wool, of Irish yarn." Hume tells us that "When this list was read in the House, a member cried, 'Is not bread in the number?' 'Bread,' said every one in astonishment. 'Yes, I assure you,' replied he, 'if affairs go on at this rate, we shall have bread reduced to a monopoly before next parliament.' These monopolists were so exorbitant in their demands that in some places they raised the price of salt from sixteen pence a bushel to fourteen or fifteen shillings. Such high profits naturally begat intruders upon their commerce; and,

in order to secure themselves against encroachments, the patentees were armed with high arbitrary powers from the council, by which they were enabled to oppress the people at pleasure, and to exact money from such as they thought proper to accuse of interfering with their patents. The patentees of salt-petre, having the power of entering into every house and of committing what havoc they pleased in stables, cellars or wherever they suspected salt-petre might be gathered, commonly extorted money from those who desired to free themselves from this damage or trouble. And while all domestic intercourse was thus restrained, lest any scope should remain for industry, almost every species of foreign commerce was confined to exclusive companies, who bought and sold at any price that they themselves thought proper to offer or exact."

The legality of these grants came before the courts in the case of Darcy *vs.* Allen (11 Coke's Reports, 84) in 1580. In that case Edward Darcy, a groom of the privy chamber to the Queen, brought an action against Allen, a haberdasher of London, for damages in that Allen had infringed the plaintiff's exclusive right under the patent of the Queen, of manufacturing and selling playing cards. The court dismissed the suit declaring that, "the grant of monopoly in an existing industry was contrary to public welfare, tending to advance prices, deteriorate the character of the product, and impoverish divers artificers and others, who before, by the labor of their hands in their art or trade, had maintained themselves and their families, who now will of necessity be constrained to live in idleness and beggary."

The position thus taken by the judges was confirmed in the reign of Queen Elizabeth's successor, James I, by Parliament. In 1623 the Statute of Monopolies was passed. It declares that, "All monopolies, and all commissions, grants, licenses, charters and letters-patent heretofore made or granted, or hereafter to be made or granted, to any person or persons, bodies politic or corporate whatsoever, of or for the sole buying, selling, making or using of anything within this realm. . .

are altogether contrary to the laws of this realm, and so are and shall be utterly void and of none effect and in no wise to be put in use or execution." The statute besides excluding from the operation of this prohibition the manufacturers of salt-petre, gun-powder, and ordnance, contained this important clause: "Provided also, and be it declared and enacted, That any declaration before mentioned shall not extend to any letters, patents and grants of privileges for the term of fourteen years or under, hereafter to be made, of the sole working or making of any manner of new manufacturers within this realm, to the true and first inventor and inventors of such manufacturers."

This provision is the foundation of that clause in our Federal Constitution which provides: "The Congress shall have power to promote the progress of science and useful arts, by securing for limited times to . . . inventors the exclusive rights to their discoveries" (Art. I, sec. 8, cl. 8), and therefore the foundation of that large class of monopolies resting on grants which we know as patents.

A franchise is another and even more important exclusive right resting in grant. A franchise, as I am here using the word, is an exclusive right to furnish a product or service which cannot be produced or furnished except by a limited number of persons, or where the importance of regular service outweighs the advantages of competition. Some of the earliest grants of this character were those which gave exclusive rights to maintain ferries over navigable rivers between certain points, the absence of competition being supposed to be compensated by the obligation on the part of the grantee to maintain at all times a reasonable service. In large cities municipal governments have always assumed the right to limit and otherwise regulate the number of persons engaged in the common carriage of persons by bus or otherwise, as part of a necessary police supervision of the streets. In addition, modern invention created a demand for the improvement of methods of inter-communication—the building of turnpikes, canals and

railroads. It has, therefore, become necessary to erect in, over or under public highways, and through private property, permanent works such as rails, telegraph poles, tunnels and pipes; and the State, not desiring to enter on these enterprises, has given to private persons the necessary exclusive privileges.

You will note that in speaking of these franchises I have called them another large class of exclusive rights resting in grant. I have not called them monopolies. Those who hold such rights may perform a service, as the carriage of passengers in street cars on a particular street, or furnish a product, as water or gas, to the inhabitants of a particular district, which no one else may perform or furnish. The element of control which comes from exclusiveness is there. The legal view of such grants, however, though formerly perhaps not very clearly expressed, has always been that the holders are under obligation to furnish the public with a reasonable service or product at reasonable rates. I stated that monopoly was a word having a bad taste. When a name usually has an evil significance, and yet may be applied to something which does not share the evil characteristics, we have our choice of explaining that the particular something is an exception to the rule, or of refusing to classify it under the unpleasant name. So in this case we can say that monopolies based on franchises, and on which the duty of reasonable service at reasonable rates is imposed, are not contrary to public welfare, or we can say that an exclusive right does not give a monopoly, when those who possess it have no control over the nature of the service or product they must give, or over the prices they can charge. It is not especially important how we decide this question of nomenclature, but it is essential to recognize on the one hand, that the grant of a franchise or exclusive right becomes a monopoly with all the evils which oppress the consumer of the products of any other monopoly, unless the obligation to give a reasonable service at reasonable rates is strictly enforced, and, on the other hand, that the justification of the exclusive right is that only by giving exclusive privileges

can the community obtain efficient service of the character demanded, or, in many cases, any service at all. To illustrate this last: Two gas companies both having the right to lay pipes in the same street are a nuisance; two telephone companies in one town cannot give as efficient service as one company, provided the obligations of the company having the exclusive right are strictly enforced; and to have two trolley lines running on a narrow crowded street is a practical impossibility.

Another basis of monopolistic power is found in contracts and combinations. A contract or combination may involve a stipulation on the part of one of the parties not to exercise his trade or profession without the consent of the other, or it may impose mutual restrictions on the amount or character of production, the prices to be paid for raw materials or labor, the prices at which the product shall be sold, the persons from whom the raw materials shall be bought, the laborers who shall be employed, or the persons to whom sales shall be made. Time forbids that I should go into even a small fraction of the large number of cases involving contracts falling under these various classes. Suffice it to say that the courts do not condemn all possible contracts falling under any one of these classes, but nevertheless they tend to look on all with suspicion. Thus a contract under which A sells his business to B, agreeing not thereafter to carry on business in competition with the business he has sold, is good; but a restraint on A's activities wider than is necessary to protect the business sold, is bad. Again, a contract among the department stores of a city to close at five o'clock, or among manufacturers to limit the hours which they ask their employees to work to ten per day, would not, I think, be regarded as a contract in unlawful restraint of trade; but a contract between several firms by which they agreed not to sell any cotton bagging for three months has been condemned. (Indiana Bagging Association *vs.* Knox, 14 Law Ann. 168). A contract among manufacturers to offset combinations among workmen, under which the

hours of labor were regulated by the majority, has been held bad (6 Ed. & Bl. 46), but the courts have refused to restrain an agreement among employers to blacklist a workman going on a strike while in the employment of one of them. With not a few of the decisions of the courts, and with much of the reasoning accompanying them, the economist may justly find fault; but slight exception can be taken to the underlying thought, that an attempt to control the market for a product is prima facie contrary to public welfare, but an effort not to control the market, but merely to impose conditions of production or distribution, though it tends to curtail the complete freedom of action of the trader, is not in unlawful restraint of trade.

In this connection an interesting question has yet to be decided by the courts. An agreement among all or practically all the producers of a commodity to sell their product to an association of which they are all members, in order that the association may demand any price for the product which it pleases, and subsequently divide the profits among the members, is bad. Should, however, we apply this principle to an agreement among all the producers of a given article in a definite locality, as all the farmers of a particular county, to sell the product through an association composed of themselves, where the market for the product is not the locality but the nation? The economic fact may be that such collective bargaining by the farmer is essential to enable him to deal on an equal footing with the middle-man or to eliminate the middle-man and deal directly with the consumer. In either case the facts justify the conclusion that the combination is not in unlawful restraint of trade; instead of being a combination to control the market price, it is a combination to end the practical control of the price by the middle-man. As stated, the courts have not yet finally passed on such combinations; but it may reasonably be anticipated that a conclusion will be reached in accordance with economic necessity. Of course, should time alter economic conditions so that large aggregations

of farmers controlled all or practically all staple-farm products, such aggregations might well become unlawful combinations in restraint of trade. What is true of farmers' associations for collective bargaining for the sale of commodities, is also true of workman's associations for collective bargaining for the sale of labor. At one time such associations were in themselves regarded as unlawful combinations in restraint of trade. Such a conclusion was based on unsound economics and class prejudice, and like other legal ideals based on similar errors, has passed out of the law.

Those who make the contracts and combinations just referred to have in most cases had as their object some limitations of competition. In only one illustration given—the agreement to close early on Saturday or reduce the hours of employment—was the object the improvement of the conditions of production. There are, however, other classes of contracts which lessen competition where the object of the parties may be in whole or in part the improvement or lessening of the cost of production, even though the parties do not intend to share the benefit with the public at large. Nearly all partnership contracts between two or more persons formerly competing in business are of this character, as are also many consolidations between two or more firms, associations, or corporations. Such contracts have never been condemned by the courts unless the practical result of the consolidation is to make possible the control of the market. The rule that where the object of the combination is to control the market the contract is in unlawful restraint of trade, and where the object is to increase the efficiency of production the contract is not against public policy, though it may entirely eliminate a previous condition of competition among the parties is, as a general proposition, economically sound, and there is a tendency in the courts to adopt it. Take the United States Steel Company for instance. Was the object of its foundation and absorption of a large number of independent and competing companies to improve efficiency of production, or to control the market, or a mix-

ture of both objects? Again, even if the purpose and the result is an increase in productive efficiency, if the result is also a control of the market, are we to regard the evil effects of the control of the market as outweighing the benefits of an increase in productive efficiency, and therefore condemn the combination as in illegal restraint of trade. On the answer to these questions the decision in the case now pending in which the company is charged with being an unlawful monopoly in restraint of trade, should and I believe will depend.

It may help us, if not to solve, at least to throw some light on, the different practical problems raised by the last question, if we leave it for a moment and pass to a description of the other factors on which monopolistic power may be based.

The possession of the entire available product gives, for the time being at least, complete control over the industry. Where, however, there is no practical obstacle in the way of others who desire to enter the field of production, the monopolistic power is necessarily only temporary. It is true that a combination to buy up all the available products of a certain community in order to control prices even temporarily should be, and is, condemned as a contract in restraint of trade. Indeed, in England in the reign of Edward VI, an attempt to "corner the market" was made a criminal offense. The statute referred to condemned forestalling, which was the buying or contracting for any merchandise on its way to market, and regrating, which was the buying of corn or other dead victuals at a market and selling them again in the same market or within four miles thereof, and finally, engrossing which was defined as "the getting into one's possession or buying up large quantities of corn or other dead victuals with intent to sell them again. But such attempts to "corner the market" were and are very different from combinations among all the producers of a given commodity by which they unite their producing organizations so as to increase the efficiency of production, even though a temporary control of products results. Such combination should not be condemned. The possible evil

due to a temporary control of the product is more than counterbalanced by the permanent gain in the efficiency of production.

The fourth factor on which monopolistic power is based is unfair trade practices. Any person or corporation commanding large wealth has potentially the power to obtain monopoly in almost any industry if willing to misuse that wealth by engaging in unfair trade practices. Mr. Rockefeller, for instance, might enter any one of a large number of industries, and, selling his product below cost, soon become the sole producer, a position he could retain though he advanced prices far above the cost of production, if it were known that he would again use his wealth to sell below cost if any new rival appeared in the industry. But the mere possession of wealth does not result in monopoly unless those in possession of the wealth are willing to misuse it in this way. That a person may be the sole manufacturer of a particular product does not necessarily mean that he has a monopoly in that product. For instance, a manufacturer of glass may make a tumbler of a peculiar design. He possesses all the tumblers of the particular pattern in existence, but he has no monopoly; any other glass manufacturer may copy his tumbler if he wishes. But give the original manufacturer sufficient wealth, plus the willingness to use his wealth to crush out any rival by unfair means, and he will have a monopoly in that particular kind of tumbler.

Some of the main unfair trade practices through which monopoly is obtained are selling below cost for the purpose of driving out a rival, oppressive exclusive contracts, and the unfair use of interlocking directorates. The first needs no special explanation. Of the second I will give a single example. Suppose a corporation manufactures several kinds of tobacco. For one brand it has by advertisement and the good character of the product obtained a wide reputation. All retailers must carry this particular brand. The company therefore has something of value which it has obtained by legitimate means; but it uses its consequent power unfairly if it says to the retailer,

"You must buy all your tobacco products from us, or we will not sell you any." This means that you cannot carry their particular popular brand which has given them a great reputation and which every retailer must carry. You ask me, what makes this contract unfair? May not a manufacturer sell his product to whom he pleases? I reply that the essential test of unfairness is in the economic pressure involved. The maker of the celebrated brand of tobacco is forcing the retailer into a contract which he does not wish to make, in order to avoid being driven from the market; and the contract which he is thus forced to make actually does drive the manufacturer's competitor from the market.

The unfair use of interlocking directorates as a basis for monopoly is frequently seen where an industry sells its products exclusively to large corporations such as railroads, and its board of directors is composed of men who are also directors in nearly all the railroads in that portion of the country. There is a possibility that competition will be eliminated from a large part of the market by the directors' unfair use of their dual position.

Our courts have for over one hundred years recognized as unfair any practice which tends to offer your own goods as those of your rival, as the imitation of his trade-mark. They have also condemned many underhand attempts to obtain a rival's trade secrets and have by injunctions prevented the use of the information thus obtained. But up to the present time they have failed to distinctly condemn any of the unfair trade practices just referred to, though at least in the case of underselling for the purpose of destroying a rival and obtaining a monopoly, and the oppressive use of exclusive contracts, the courts may be said to be about ready to hold such acts wrongful.

The last basis of monopolistic power referred to is the control of a factor necessary to production. Such factor may be the possession of a patent, the possession of transportation or terminal facilities, or the control of the natural resources from

which the necessary raw materials of production are procured. He who controls a necessary factor of production controls the market for the sale of the commodity. The control, differing from that which springs from the mere temporary possession of all the available supply is permanent. Therefore, when two or more separate producers combine, though their object may be to increase their productive efficiency, if as a matter of fact their combination results in the control of one of the economic factors essential to production above described, the result of the combination, though it increase the efficiency of production, will be a permanent control of the market. The evils resulting from this control, unless they can be counteracted, are likely to outweigh the benefits resulting from the increased efficiency of production. The practical solution of the problem presented would be to retain the benefits of increased productive efficiency by allowing the combination to remain, but deprive it of its basis of control of the market for the finished product. This could be done either by requiring the combination to relinquish its exclusive control of the economic factor essential to production which it possesses, or by regulating the price at which anyone desiring to enter into competition with the combination may obtain a reasonable quota of the particular essential factor. For instance, suppose the economic factor which gives a combination its control of the market is the possession of a patent. We should not destroy the combination, but insist that it permit its rivals to use the patented article on payment of a reasonable royalty. Or again, suppose the economic factor is the possession of all the natural deposits of some raw material. The solution would be, not to break up the combination, but to allow others at reasonable prices to procure a reasonable portion of the raw material. Whether the courts unaided by permissive legislation can or will adopt this, the only practical solution of a growing class of cases is doubtful. As our judges are situated, it is inevitable that they should try to avoid decisions which necessitate putting in motion elaborate administrative machin-

ery. To permit the existence of a combination only if it permits its rivals under reasonable terms to share the advantage of its exclusive possessions—as patents or mines—involves continuous administrative supervision. Such supervision the courts are not organized to give, and therefore unless our statute law can provide additional administrative machinery to bear the burden, we may anticipate that the courts will decide that a combination which controls a factor necessary to production is in restraint of trade and contrary to public welfare, even though the combination aims at increased efficiency and actually lowers prices. Personally, I should regard such action as most unfortunate; but as inevitable unless administrative machinery is provided to enforce a more practical if more simple solution.

No one can read the cases dealing with monopoly without being impressed with the fact that while serious errors have been made in individual cases, the general result has been sound. Contracts which tend to give to one or all of the parties the power to oppress have been condemned; those which have no such effect have been left undisturbed even though they may tend in some degree to lessen competition. While some courts have said that competition is the life of trade, other courts repeating the maxim have had sufficient common sense to see that there were exceptions to the rule.

To this commendation of the general trend of judicial decision there are two exceptions. As yet our courts have uniformly disregarded the possibility of any distinction in combinations between two or more persons engaged in the manufacture of an ordinary product, and combinations between those engaged in what is known as public service. As I have pointed out, those who are engaged in public service possess an exclusive franchise, and in return for the franchise they are under the legal obligation to give reasonable service at reasonable rates. Prior to the Interstate Commerce Act this obligation was not enforced. Now, as a result of the creation of the Interstate Commerce Commission and other similar

commissions in the different states, though we have not nearly arrived at an efficient enforcement of the obligations of public service companies, we are rapidly approaching that condition. As a result, the time has come when it is proper that we should consider whether combinations among public service companies, even though as a result competition is permanently eliminated, should be regarded as in unlawful restraint of trade. In many cases efficiency of operation is distinctly promoted by the combination, and, as has been already pointed out, those who combine do not as a result of their combination, control what we may call the market, since the price to be charged for their services is under an increasingly active public control.

The other respect in which the courts are open to criticism is their failure as yet to condemn many practices which for a long time have been regarded as unfair by the business world, as selling below cost, or exclusive oppressive trade contracts, for the purpose of obtaining a monopoly.

Up to the present time, as a people the distinctive feature of the whole subject of monopoly has been that we have left the definition of monopoly, of unfair trade practices and of combinations in restraint of trade to the courts. The courts have developed the law by the application of indefinite principles to individual cases. This is as it should be. Combination in restraint of trade, unfair trade competition, attempts to monopolize are wrongs. The experience, not only of England and America, but of the continent of Europe, is that to attempt by statute minutely to define what acts shall be considered wrongful, is simply to render courts powerless to attack new forms of any old wrong as they arise. This is true of wrongs of violence to persons or property, and true also of those wrongful acts known as combinations in restraint of trade, unfair trade practices, and attempts to monopolize. The Sherman Anti-Trust Act wisely leaves the law as to what constitutes a monopoly or a contract or combination in restraint of trade in the indefinite condition in which it is at common

law. The first section condemns all contracts and combinations in restraint of trade or commerce with foreign nations or among the several states. The second section condemns the act of monopolizing or attempting to monopolize. Whether the second section condemns anything which is not condemned at common law or indeed adds anything to the first section is a matter which has not yet been made clear by the decisions of the Supreme Court of the United States or the language of its judges. Practically, whatever the decision or the language, it is probable that nothing will be condemned as wrongful which would not have been condemned under similar economic circumstances had the statute never been passed. The important result of the statute is not that it makes wrongful that which without the statute would not be wrongful, but that it makes those contracts in restraint of trade, which were merely unenforced as between parties, criminal. More important still, the Act gives to the Attorney General of the United States the right by proceedings in equity to obtain a decree restraining the execution of the contract or dissolving the combination. Thus it is not the language designating the wrongful act, but these administrative features which give the Sherman Law its great importance. And the important acts which will be passed in the future will, I believe, follow to this extent this much discussed Act—they will be administrative statutes, not statutes attempting to define contracts in restraint of trade or prohibit this or that specific practice, as interlocking directorates.

Finally, the success of the Interstate Commerce Commission probably indicates the direction in which the new administrative reforms will take place. We will have, if not at once, probably at no distant day, an interstate trade commission and this commission will be something more than a mere investigating body. Like the Interstate Commerce Commission, it will be clothed with power to directly prohibit unlawful acts—combinations in unlawful restraint of trade or unfair trade practices; and when confronted with the difficult prob-

lem presented by a combination which in some respects is beneficial because it increases the efficiency of production and in other respects is harmful because it tends to control the market and entirely eliminate competition, the commission will be given power, while preserving the combination as a business organization, to divorce it from the exclusive control of the economic factor which gives it monopolistic power.

Personally I believe that the creation of such a commission will be the greatest advance yet made towards a permanent solution of the so-called "Trust Problem."

SOME PROBLEMS OF HEREDITY

By C. E. McClung

Professor of Zoology, University of Pennsylvania

It is not strange that in all ages and among all peoples there has existed a lively interest in the problems of how we came to be what we are, and in the more general one of our relation to the whole system of conditions in which we find ourselves. A solution of such problems has largely been sought by philosophical considerations based upon the ordinary experiences of humanity. The result has been the creation of almost as many theories as there are possible experiences, and a decision between them is not attainable because there are no criteria for evaluating the relative worth of the individual experiences. This method of solving the problem reaches the limit of its usefulness when all the conceivable possibilities have been considered. At its best it is a mere statement of the case and each individual will take from it that part which his natural endowment enables him to put into it.

Our own times are characterized by the most extensive, accurate and complete methods of enlarging our experiences that the world's history has witnessed. We have minimized time and space, we have enlarged our powers of vision enormously, we have provided means for permanently recording our experiences and judgments and have in many other ways provided for the increase and conservation of our knowledge. The collective name for all these means of gaining knowledge of ourselves and our surroundings is the scientific method. This is the age of science. It is the time when we turn our vision forward, when we cease to regard forms and authority highly, and when we seek to measure facts and relations only by the truth.

In bringing about a changed and enlarged outlook biology

has played, and must continue to play, a large part. Within the period of a little over half a century since the announcement of the theory of evolution by Darwin, almost every social activity has been changed and has been brought into relation with the whole complex of natural forces under which we live. This theory is one of the possible explanations long ago conceived out of the inner consciousness of some primitive man to account for the evident resemblances between apparently different objects. His neighbor, possibly, scouted the opinion that there was any significance in the resemblances and dwelt upon the evident discontinuity manifested as proof that present diversities exist because they were originally present and have since remained. The war of words was on—successive generations of philosophers argued for continuity and discontinuity and each left the problem where it was in the beginning until Darwin applied the scientific method to the enlargement of our experiences and thus provided a criterion which our reason could apply to a decision between the two theoretical possibilities of continuity and discontinuity.

Our reason being satisfied that we are an integral part of the series of forms and circumstances which surround us, we then find ourselves confronted with an entirely different outlook upon life. For if we are the product of the orderly series of changes which has left its record in the gradually ascending chain of organic forms then we must summarize in our own constitution the results of the experiences through which these preparatory members passed. We should therefore be in a position, as has been the case at other stages of the evolutionary process, to utilize these summed up experiences as a means for further advancement.

Here, however, we face what seems to be a unique condition, so far as can be seen, for all previous advance appears to result from the operation of forces of which the involved materials were but unconscious instruments. Most significant of our relation to the problem is the fact that we stand at the end of the series of changes and, looking about us, perceive and

dimly understand the part we play. With our coming there has entered a conscious element into the problem. Consciousness immediately demands knowledge as a necessary preliminary to action. We are therefore just at the point where we realize the need of information and are not always apprised of what is most required. Despite this uncertainty investigators in all branches of science are eagerly at work wresting facts from their concealment and uniting them by hypothesis into instruments for the acquisition of more knowledge.

Although only at the beginning of our search we witness, as a result of the efforts so far made, a lengthening of human life, an enrichment of it through better material conditions of existence and a broadening and deepening of it because of the realization that at last we have reached a place where we may begin to understand and to help in the furtherance of the great plan of which we are a part. No more inspiring thought, it seems to me, can animate our lives than the one which promises the advancement of the ultimate good of the race. To this end all true science finally contributes, and the knowledge that this is so is itself full reward to all its followers. It is neither wise nor proper to disregard or to minimize the hard won intellectual achievements of those who have preceded us; we owe them much and they will always be a source of inspiration and help. But with due regard for this obligation our present duty is clear—not in content to admire and to reap such advantage as we may from these achievements, but to push forward vigorously in the prosecution of our researches and to turn the results into channels of service to our fellows as rapidly as possible.

In this spirit there is an army of workers, speaking many tongues, following many leaders, and working with many materials, but always co-operating together in the battle against error and superstition. Among these is a group called biologists, because they work with living materials. They also speak many tongues, but have a common language which

most of them understand, although few outsiders do. So much is there to be accomplished, and so short is the time, that only rarely does any one of them pause long enough to interpret into common language the discoveries that have been made or to suggest methods for their use. Sometimes it happens therefore that those who have interest, but not understanding, impatient of the slow progress of the toilers and fired by zeal for social service, or perchance animated by even less worthy motives, call for action upon some partly established principle or working hypothesis and harm instead of good results.

At the present time an awakened social consciousness is calling for improved racial conditions, among many other plans for human betterment, and the biologists are asked to provide the rules for carrying this purpose into execution. To many this call for specific service comes unwelcomed because, in the first place, it is not felt that our knowledge is definite enough and complete enough to be directed toward so significant an end, and in the second place it is not believed that we have yet been able to apprehend an ideal toward which to work. Without such a directing ideal we can not shape our procedure. It cannot be that mere physical perfection is our aim, for we desire no repetition of the conditions of old Sparta, where this ideal was held and approximated. Certainly we wish a population of sound and healthy bodies, but no system of eugenics is required to obtain this. The forces which brought the human race to its present high state of development, supplemented with our knowledge of disease conditions, is amply sufficient to maintain a high level of physical vigor if only the entirely preventable causes of degeneracy and crime are removed. If the effects of alcohol, drugs and social diseases were eliminated a good healthy stock would soon result. To attempt the breeding of a better race while permitting the agents of destruction constantly to degrade it is worse than folly.

Again it cannot be that the dead level of innocuousness is the aim of those interested in human betterment. It is the exceptional, unusual or even abnormal man who stands out above

his fellows and makes for change and progress. The results of all our biological studies point to the appearance of such unusual, or abnormal, individuals as the means of progress in development. What we seek is a knowledge of the conditions under which exceptional organisms are produced. With this we might hope to evolve the superman, without it we can do no more than to permit the forces of nature unhampered action.

But it is not my intention to dwell overmuch upon the application of biological principles to social service. Speaking as I do, however, to a general audience whose main interest in problems of heredity must lie in their human application I feel that it should be made clear that no one more than a biologist could desire to make his work of service to his race, and further that any apparent lack of interest is due to the jealous regard in which such accurate and well-determined service is held. Having now shown, I hope, that principles of heredity may have very great significance for us all, I will assume the rôle of interpreter and attempt, as simply as possible, to say in plain English some of the things that biologists report to each other in their own peculiar jargon. In passing, I should perhaps note that the use of this unusual language is not an affectation, or a cloak to conceal ignorance, but results naturally from the discovery of objects for which there are no common names, and also from the need for definiteness and brevity. The existence of such a specialized language and the habit of its use, coupled with the inevitable restricted point of view resulting from detailed study, makes it difficult for the specialist to bring his work before a general audience. I am sure, however, that I shall have your kind indulgence and in return I will do my best to avoid technicalities.

Let us then note that all the manifestations of hereditary processes take place in one particular substance, the "physical basis of life" called protoplasm; that this occurs in definite units of structure, named cells, which reproduce themselves by division; that the beginning of each new living thing, under ordinary circumstances, is one of these units; that in its

genesis such a beginning unit is derived in equal measure from two parents; that by repeated divisions this one unit produces a multitude of dissimilar units which are so related as always to produce approximately the same co-ordinated group—an organism; that we appraise the relationships of such organisms by the degree of resemblances between them; that in judging of these resemblances we compare certain features of organization which we call characters; that these characters act as units and may be separated out and redistributed in various combinations.

The significant facts in relation to modern studies of heredity are that there exist these more or less independent unit characters and that a mechanism to account for their behavior has been found. It is with regard to these two points that I desire to speak in detail. Our knowledge concerning unit characters we owe primarily to an Austrian monk by the name of Mendel. His story is one of the many tragedies of human endeavor in which a new truth, significant and important though it be, fails of appreciation and service because it falls upon deaf ears. This man for eight years consistently followed out a new and fruitful method of studying heredity problems, and when he had secured results which constitute one of the most notable contributions to biology, and had personally brought them to the attention of a leading authority, they remained without notice for almost half a century and had, in fact, to be rediscovered.

The discovery made by Mendel that there are unit characters and that they behave in a definite way took place under the most modest circumstances and with the humblest of materials. In the cloister garden and with the edible peas which served the monastery for food he worked. Here, in brief, are his results, illustrated by a typical case. By crossing a tall variety of peas with a short variety he secured in the next generation all tall plants. Such plants are self-fertilized and he permitted them to produce seed in the usual manner and then planted them all. His second generation showed plants of the two grand-parental types in the definite proportion of three tall plants to one short one. These again were

allowed to reproduce in the usual manner with the result that all the seeds from short plants produced only short plants as did the descendants after them. The tall ones, on the contrary, were of two types. One-third of the three-fourths of the first generation of the cross produced always tall plants, the other two-thirds behaved as did the first cross and produced tall and short plants in the proportion of three to one. In a similar way he noted that the yellow color of the seed behaved in relation to the green color; the smooth form of the seed to the wrinkled form, and colored flowers to white. These are the essential facts of his discoveries: that there are a variety of unit characters; that when two different expressions of one such unit are brought together one of them dominates the other to its exclusion in the first generation; that in the second generation these are sifted out and appear in the next generation in the proportion of three of the dominant to one of the masked or recessive; that one-fourth of this second generation are pure dominant and one-fourth pure recessive.

These results of Mendel have been confirmed for many other plants and animals. One example will serve for the conditions in animals. If a white guinea pig is mated with a black one all the young will be black. When these black young reproduce by breeding among themselves their progeny will average three black to one white. As in the peas, the masked white which reappears in the second generation continues as a pure unit character, while the black are mixed—one-third being pure black, the other two-thirds being hybrid or mixed like the first generation of the cross.

So far as any one could determine from an inspection of the tall hybrid peas of Mendel or the black hybrid guinea pigs they are not different from the parent they resemble. The significant fact is, however, that they are different. Into the black hybrid guinea pigs went black and white; from them emerged again black and white in different individuals. The conclusion from this is obvious—there is some persistent factor which, although not patent in the first generation, yet is handed

on by it to the second generation, where it becomes manifest. Stated in another way, the fact is possibly more striking: the white guinea pigs of the second generation are not like their two black parents, but resemble their white grandparent. That like produces like is therefore only partly true, for in this case black apparently gave origin to white. How this comes about I hope to show later.

Another botanist, this time a Dutchman, has given us an account of one more method by which offspring are formed unlike their parents. In an abandoned garden near Amsterdam, Hugo de Vries found large numbers of an evening primrose which had originally come from America. Observing these he was surprised to note that they displayed marked differences. The seeds from one plant, he found later by careful observation in his own garden, produced not one kind of offspring but several, all of which resembled the varieties in the wild garden. These experiments were continued through many years and repeatedly the same phenomena were observed. The newly produced forms continued to breed true, occasionally reverting to the original type from which they sprang. Like the peas of Mendel the primroses are self-fertilized so that material from one plant gave origin to its own kind as well as to new kinds. But these resemblances and differences are not of a general and ill-defined character but concern definite modifications of plant structure which are like the unit characters of Mendel. A significant difference exists between the behavior of the unit characters in the peas and in the primroses. In the former instance unlike parents produce young resembling one of them and their grandchildren are again both kinds, always in definite proportions. The results are always according to rule and open to prediction. On the contrary, a self-fertilized primrose at once, in the next generation, brings forth its varied offspring which cannot certainly be predicted either in kind or number. The mutation or jump of the primrose is also a rare occurrence while the alternation of unit characters is a common if not universal phenomenon. It is to be noted as of great significance

that in both cases varied reproduction takes place when new individuals are produced from the union of single cells derived from two sources.

In a series of experiments, to which I now wish to direct your attention, this same process of producing new individuals from a single cell of duplex origin results in still another form of diversity. This time the experiments of a Danish botanist, Jóhanssen, tell the story clearly. His purpose was to test the effectiveness of breeding always from selected individuals. He chose as the object of his investigation the ordinary garden bean and used for an index the unit character of seed weight. Nineteen beans from different sources were planted and the average weight of the seed produced in the next generation was noted. From each of these series the largest seeds were selected and used to start a new generation. The progeny of these selected members were then weighed and it was found that the product was not of the nature of the selected seed, but averaged near to the mean of the group from which selection was made. In other words, the offspring were not like the immediate parent, but had the character of the line or race. A similar result was obtained almost at the same time by Jennings, formerly of the University of Pennsylvania, using a one-celled animal.

The alternative inheritance of the peas, the mutations of the primroses, and the swing away from the condition of the immediate parent to that of the group in the beans have this in common—the determination of the nature of any unit character cannot be made from a knowledge of it in the immediate parent, but depends upon an intimate acquaintance with the stock. That is, we cannot tell what will come out of an individual unless we know what went into it. There is then something that stands for continuity in inheritance, which binds together a series of similar forms even though interrupted by apparent suppression through more powerful influences. This agent of continuity is a material one and it is manifest as a distinct type of cell which may be traced in all its changes from one

generation of individuals into the next. From the beginning of the existence of the group, indeed, this unbroken chain of cells has continued. Resemblances of large numbers and between distant generations are easily comprehended when it is understood that each individual organism has its beginning in one of this directly related, continuous line of cells. Not only do we thus gain an insight into resemblances, but from a knowledge of the intimate character of such cells we find reasonable explanations for many phenomena of heredity that are otherwise obscure.

This part of my subject is most interesting and it is a pleasure to record that American biologists have taken a large part in advancing our knowledge of the function of the reproductive or germ cells in relation to heredity processes. Such cells are of two kinds—large, passive, food-laden eggs produced usually by a separate individual celled female, and, small, active sperms coming from a male individual. In the production of a new animal or plant one egg and one sperm unite. Of the essential material, which experience has taught us is concerned with the control of development, each cell contributes equally and in duplicate. For any one unit character there are two possible controls. Thus in the case of the black and white guinea pigs, one parent contributed a control for black hair color, the other for white. Black prevailed, but white was present potentially as was proven by securing it in the next generation. Each individual is, therefore, duplex in its characters, but since its offspring are alternately one or the other of these two possibilities there must be a time in the germ cells, which are also originally duplex, when these alternative controls are sifted out and put into different cells. This theoretical requirement is actually fulfilled at a time when the germ cells prepare to join with each other to produce a new organism. Both egg and sperm undergo the same preparation, during which the material controls for these two alternative characters are sorted out and put into different cells. In the case of the black and the white guinea pigs it works out concretely in this way:

A black female, produced by crossing a black with a white parent, prepares its eggs for subsequent union with sperms by separating the particular control material contributed by the white parent from that received through the black parent. Correspondingly in the black male of the same nature, black control is segregated from white control. In bringing together eggs and sperms of these two kinds there is equal chance of white joining with white, or white with black. The result is four possible combinations in equal numbers—white with white, white with black, black with black and black with white. Since, however, white does not show in the body when present with black there would seem to be three blacks and one white. Experience has taught, however, that one-third of these three blacks is purely and entirely black while others are mixtures. This is explained by the mechanism which we find in the germ cells. In other ways also the parallel relation between developmental processes and germ cell structure could be demonstrated did time permit.

I have sought to show by some concrete examples the character and extent of our knowledge of heredity. From all these it is clear that we must know what there is in the particular germ plasm we are experimenting with before we can calculate or control its behavior. It is not enough to know merely the two individuals which we use in any mating. Given such a knowledge it is possible in certain cases to sift apart and to combine in new ways the characters desired. This has provided an accurate means in these instances for the production of new and desirable strains of plants and animals and has substituted scientific accuracy for crude empiricism.

If, however, we wish to apply these rules to human breeding we must face these necessities: an accurate analysis of human traits in general, a knowledge of the peculiar character of the two strains concerned in each mating, and more detailed information of the germ cell mechanism. Finally, if such breeding is to be directed to some end, we must have an ideal toward which to strive.

THE NATURAL HISTORY OF THE GRAPE-VINE

By John M. Macfarlane

Professor of Botany, and Director of the Botanic Garden
University of Pennsylvania

Were any of you to ask me today why I have chosen "The Natural History of the Grape-vine" in a general lecture course I would reply that the subject opens long vistas in plant life, in animal life, and not least, in human life. Further, the grape is one of our most choice fruits, and has, as I believe, a great future in its relation to the human race during the decades and centuries yet ahead.

We handle with keen interest the neolithic stone knife or arrow head that was shaped by man mayhap ten thousand to twenty thousand years ago; we venerate buildings that were reared five thousand to six thousand years since; we study languages that were in their human infancy three to four millennia removed from us, that attained to a rich climax of expression and that are now extinct as living tongues; we study the lives of sages who perfected these languages and who, fully two thousand years ago, crystallized great thoughts for us in the perfecting act. But, before the earliest of these events, the grape-vine was linked with human life, has since developed an increasingly varied and complex existence while races of men were rising to power, reached their zenith of splendor and then became scattered or suffered decay. Today, amid the civilizations of this continent and of Europe, the grape-vine still is a dominant and progressive plant, whose advance in recent centuries is presage of an ever better and more diversified evolution in the future. So a plant that has had a renowned historic past, that has a world-wide fame for the present, and whose coming days promise great things, surely deserves our attention.

My wish now is to picture this plant to you as a thing of life; as an organism that has slowly elaborated a definite structure; that has developed and steadily perfected exact functions or activities; that has close affinities with related organisms the world over; that in its fossil representatives carries us back for at least hundreds of thousands of years; that, like other organisms in this world, is subject to disease through attack by other and hostile plants, or by like action of animals; that has become increasingly intertwined with human history and so has evolved with evolving man, as have the banana, the cabbage, the horse and the dog; that finally claims existence and achieves it, as does the highest type of man, by its ability to compare with and to survive alongside the best types of other organisms around.

We shall now take up these categories in such order as may best conduce to our elucidation of the subject, and if at the close of this lecture our plant seems to some of you to be a more real, sentient and interesting character than it has appeared in the past, then remember, please, that such is equally true of nearly every one of our highly cultivated plants.

The historic method is now felt to be the safest guide in all scientific investigation. So if we inquire when the grape can be first clearly recognized on the stage of time, we are carried back, it is safe to say, a half million of years and to a region so closely associated now with vine culture as the area around Marseilles. For there in strata of the mid-tertiary epoch fossil remains have been found that so nearly resemble the existing European species as to have earned for it the name Vitis prævinifera, or the ancestral grape-vine. Few plants now living can show so ancient a pedigree. But equally along the inhospitable shores of Greenland, in mid-Germany, and in Wyoming beds related vegetable remains occur, while close similarity of the leaves, the tendrils and the seeds to recent types indicate how slow may be the processes of variation and species evolution once a type has become adapted to a suitable environment.

But birds and frugivorous mammals were then abundant, so grape fruits were doubtless devoured and grape seeds carried by such animals many miles from ancestral vines until, in the course of passing centuries and millennia, representatives of the group were met with round the entire world, though mainly in warm-temperate and sub-tropical climates.

In this process of migration, seeds could not fail to be carried occasionally to regions that were very different from each other in climatic conditions, or that gradually changed in their climatic and soil relations during the lapse of ages. So in the hot, dry regions of southwest Africa species have slowly evolved into semi-cactoid forms, the stems of which are short, swollen, succulent, and which, during the brief wet season, quickly form canes with thick fleshy leaves; or again, in Central Brazil a type has arisen in which the sensitive tendrils can either wind round supporting objects, as in the common grape-vine, or failing in this, form adhesive suckers at the extremity of each delicate tendril, and so glue themselves to any tree or rock surface after the manner of the Virginia or Japanese ivy, both close relatives of our grape-vine. But even more striking in this Brazilian neighbor is the annual production at the extremity of each season's growing shoots of green tuberous, almost potato-like swellings, which, dropping to the soil below, in time take root and produce new vines for a succeeding season.

But suggestive though such modifications may be, it is the production of succulent edible fruits that has given to our plant its unique value and renown. And it is worthy of note that there are few warm-temperate or sub-tropical areas of the Northern Hemisphere or of South America in which species of grape-vine do not occur, which by steady cultivation and selection by man might not produce fruits of high quality. We find such promising examples in the Amur and the Himalayas, in China and Japan, in Arizona and California, in tropical America and in Central East Africa. But until a hundred years ago one species alone, amongst the thirty-five at present known, had developed so markedly alongside observant and

selective man as to give promise of a surpassing future greatness.

We have every reason to believe, however, that long before man appeared on this earth birds were actively concerned in the natural selection, the dissemination and the perpetuation of the best fruiting forms. But as man advanced from the crude semi-animal, semi-barbaric stage to a higher platform of well-being he recorded for us his advance, among other ways, by the wonderful transformation wrought in the single species that we now commonly call the European grape-vine, and which to the botanist is known as Vitis vinifera.

But before linking man's history closely with it, let us note some of the peculiarities of grape-vine structure and function that not a few of you may be more or less familiar with. For this end our native American grapes will amply suffice. As we survey a soft shoot such as has already lengthened out during the past few weeks, we observe beside each leaf a delicate tendril that often divides into minor branches. These, when young, are surprisingly irritable and sensitive to contact with other objects, so as to wind round them in corkscrew-like coils. Thereafter, by continued growth and hardening of the tissues of the tendrils, these become firm ties that bind the soft shoots to surrounding supports. Each successive tendril then forms a new binding cord that aids each lengthening shoot in clambering upward toward the light.

But how have tendrils arisen, and what is their history? In reply, let me say that, if one watch a blooming grape-vine in June, the reason will probably be forthcoming, for not unfrequently we note that one or several of the flower clusters have in part matured into blossoms, in part have had their flowers absorbed and their flower-stalks largely modified into tendrils. So, from the many transition stages observed, we unhesitatingly say that the tendrils of a grape-vine represent modified flowering branches. Such transformations the botanist frequently encounters, and they furnish partial proof of the universal principle that form and structure are constantly

being modified, molded and re-adjusted, so that a former activity or function may become radically changed into another that may better conduce to the life and well-being of the organism. In other words, what we call matter, whether living or dead, is a passive, inert aggregate of invisible atoms that alone can assume shape, consistency and continuity when currents of appropriate energy traverse them and cause them to become attuned to definite environal conditions that are helpful to the organism.

But the flowers may now claim our attention. When early and balmy June days have come, shoots of the grape have already expanded their leaves, and inconspicuous yellow-green flower clusters appear amongst these. Often one is guided to them, as they expand throughout tangled thickets, by the delicious characteristic odor they exhale. Now such odors are regarded as an attraction not for man, but for passing insects, whose visits may aid in dissemination of pollen. But whether such visits are helpful or beneficial is still a strongly debated question in the present case.

To understand the situation, let us consider for a little the structure of a flower from the bud stage to its full expansion. Each shows a shallow rim bearing five minute teeth that are the sepals or outermost floral organs. Within is a swollen green knob that cracks round its lower margin as each bloom expands, and is then pushed or shot off as a small cap-shaped corolla by the lengthening stamens within. Such type of corolla is eminently peculiar to the grape-vine, and would alone suffice to distinguish it from all others. With this discharge the now expanded stamens, and the small central pistil that will in time mature as the fruit, become visible. But peering between the bases of the five radiating stamens and the insertion of the central cone-shaped pistil, sharp eyes can discover five bright yellow swellings, the nectaries, that often glisten in the sunshine as if distilling honey.

Now, during the past forty years, the famous aphorism of Darwin—that "nature abhors perpetual self-fertilization"—

has caused us often to regard agreeable odors and nectar secretions as sure indications that insects are allured to the flowers, there become dusted with pollen while sipping the nectar, and then flit to other flowers or even plants, so as to cross-fertilize the little ovules within the pistil that later might become seeds.

But over this question a war has been waged during the past twenty years that is by no means settled, and which some of you here, by close watching, might do a real service in elucidating. For one group of botanists holds that, since the blooms are small and unattractive in color, radiate out their stamens conspicuously, and produce from these loose powdery pollen grains, these last might fall on the stigma of the same flower below, thus effecting self-fertilization, or failing in this, that the pollen might be blown by wind to other flowers, thus effecting cross-fertilization, though without the need for insects as carriers. Others hold that the attractive odor, the relatively small amount of pollen formed and the secretion of nectar all point to insects as active agents in the transport of pollen. But while it is undoubtedly true that a great variety of insects often frequent the blooms, one observer in the rather cold climate of Germany asserts that the nectaries exude no honey; another, watching under bright Italian skies, states that it is abundant.

Can we then reconcile these decidedly conflicting opinions? Such seems entirely possible from what one can observe. For not unfrequently during a slight cold breeze pollen may fall and self-fertilization may occur, or the pollen may be wafted by stronger winds to some little distance and so cross-pollenation may ensue. Further, while on warm, moist days nectar may exude and insects be thereby attracted, on cold, windy days the nectaries may remain dry and insects may be correspondingly absent. Here is a field in which minute and accurate observations may add not a little to our store of scientific truth. But, as in the case of hollies, of some maples and other common shrubs or trees, so, for some at least of our native grapes, like the Muscadine of the South, it has been

shown that the blooms on one plant may be functionally staminate and so pollen-producing, but sterile as to fruiting, while another plant may form sterile stamens but a good pistil and so be fruit-producing. It therefore follows as a necessity that both types of plant must be grown in the vine orchard, while the value of bees in carrying pollen to the pistillate flowers has been emphasized as an appropriate corollary. Another illustration this of interdependence between organisms!

The little cone-shaped pistil carries in each of its paired ovarian cavities two small ovules which, after fertilization, become the seeds, as the maturing pistil changes into a berry. And this berry it is that has given to the grape-vine its high human interest and perennial value. So we may attempt now to trace its history from this double standpoint.

The endeavor carries us back to that period in human history and that stage in human civilization which we associate with the Swiss and Italian Lake dwellings. Who the lake dwellers were, when their buildings were planted over the lakes, what the life was that then was lived by primitive Swiss or Italian men, are questions to which we still have only a partial answer. In the lake bottom, amongst seeds of the barley, wheat, apple, linseed and many others, occur also those of the grape; while the weapons or implements of stone, of bone or of wood tell us that man there and then lived in the newer stone or neolithic age. Whether this may have been 2,000 or 10,000 or even more years before the advent of Minoan, or of Greek civilization, it is impossible as yet to say, but we may safely conclude that primitive European men of 8,000 to 10,000 years ago had already recognized the potentialities of the grape-vine and even had cultivated it with some care.

The plant thus selected and brought within the ken of human history was what we now commonly call the European grape-vine or that the botanist names Vitis vinifera.

During the past century varied efforts have been put forth

to discover its native home. While the assertion has recently been made that it was found in a wild state over a wide area from Persia and Turkestan on the east to France and central Germany on the west, the more widely accepted view is that, like nearly three-fourths of our present cultivated plants, its primitive center was in the rich upland plains of Persia and the Pontus, home of the old Iranian race, and to this region our eyes and our minds increasingly turn as the probable center of origin for our letters, our art, our monotheistic religion and, not least, for the early cultivation of our choicest fruits. Here, undoubtedly, an active, hardy, aspiring and intellectual race lived, who held their own alongside more rude and barbaric tribes, while persistent efforts by them to improve the grape-vine, as well as many other promising plants, may long have antedated and even have given rise to the ancestors of "the grapes of Eshcol."

But as traders or seers from that Medo-Persian center passed outward among other nations, the fame of their grape-vines became spread abroad, so the produce and the culture spread southward and westward with the passing millennia. This explains to us the numerous references in ancient literature from the time of Homer to the days of Imperial Rome. The great attention given to it also by progressive man of that period explains the increasing abundance of those varieties that excited the interest of Vergil in later centuries. Now all of this effort has often been spoken of and regarded as the artificial culture of the grape-vine. But it is in no sense more artificial than are any of those actions and reactions that we see proceeding everywhere in nature, in which one organism acts on another and the latter responds by definite reactions. So man and the grape-vine, as organisms widely apart, have become intimately associated in a common progress that is mutually beneficial. Fundamentally, too, this in no way differs from the reciprocal relation between bees, humming birds, slugs or bats and the flowers which they frequent, or between the roots of leguminous plants and the minute organ-

isms that form tubercles there, so as to utilize loose nitrogenous compounds for the former.

It thus came about that by incessant cultivation and selection by man, along with variation and environal modification on the part of the plant, new and ever better types appeared, which, while hereditarily retaining—often in tenacious manner—much that was good and improved, as well as much that might be old and undesirable, ever tempted man to renewed endeavor after further improvement and advance. Exactly the attitude and principle that has caused him to evolve—or shall we rather say invent—the camera, the bicycle, the automobile and the aeroplane, caused him often unwittingly to mold, to change, to develop and to select new varieties of grape-vine, as at one time his inclination or fancy led him to favor a light-skinned or a dark-skinned grape, a somewhat acid or a sweet grape, a strong and vigorous grower that a rich soil had stimulated, or a short branching type that a gravelly hillside called forth. Each might have some commendable qualities, each might supply some want that was diverse from another. Need we wonder then that by the beginning of our new era practically all of those varieties that are leading types of today had originated from the primitive grape-vine.

The establishment then of the Roman Empire ensured the widest possible distribution of the finest and most varied sorts of vine, the ever-lengthening highways that extended for many hundreds of miles from the throbbing heart of Rome, permitted the continuous interchange of ideas regarding modes of cultivation, harvesting of the fruits, and treatment of the vintage. For be it remembered, the history of the Roman Empire for 400 years was not one merely of invasion, of conquests, of robbery, of dissemination of the good as well as the bad graces of civilization, of enslavement of peoples, of political and social unrest and chicanery. It was a history also—unfortunately, too seldom recorded even in outline for us—of the steady and beneficial dissemination of the best products of each country incorporated, of the best as well as the worst thoughts

that the minds of each country originated, of the noblest religious outlooks and aspirations in life, as well as the most pessimistic and degrading fatalism.

During the dark ages then that succeeded the breaking up of the empire, the best types of manhood slowly asserted themselves, and alongside these newer and more adaptable types of grape-vine were welcomed. So from Persia on the east, to Spain, France and the Madeiras on the west, hundreds of varieties of our plant were recognized and their qualities reported on by various writers. And when we consider that the sweeter and larger fruits could with care be kept in condition for three to four months as a table delicacy, that the expressed juice or the manufactured wine became the beverage of many millions, that the corinths or currants were a widespread preserve, need we wonder that the grape-vine became the plant round which the poetry, the prose fiction, the mental efforts and the economic activities of man largely centered?

How much of fundamental modification also had been effected by man in the size, shape, character and condition of the stem, leaf and fruit is well illustrated if one recall a picture of "the vine-clad hills of Bingen," with their myriads of walled-up terraces covered by low, bushy plants, each bearing six to twenty fruit clusters that yielded their wine crop in the autumn, and contrast such with the huge solitary specimen that fills the grape house at Hampton Court with fully 200 square yards of leafy branches that has often borne from 1,200 to 1,500 clusters in a season, whose weight would total about 2,000 pounds, and each cluster of which would nobly fill a dessert fruit dish of average size.

With such lessons before us it might have been supposed that plant breeding, plant selection and plant adaptation would early have become a refined and exact scientific inquiry in our university halls and laboratories, would have stimulated many inquiring minds to trace out the deep-seated principles that governed such changes, would have induced liberal patrons of the arts and sciences to donate wide acres where patient experi-

ments could have been conducted and abundant observations could have been gathered and collated. But with the exception of liberal and gifted minds like those of Bacon, of Matthioli and of Ray, the scientific spirit and scientific methods almost wholly slumbered in educational centers till a century ago.

The unbiased, unfettered and advancing body of the people, however, noted results and aspired toward greater things. So with the advent of a Stephen Hales, a Kölreuter, a Gärtner, a Sprengel and a Darwin, new methods and principles were established, new outlooks were perceived and new hopes inspired man to fresh effort. So it has happened that plant breeding has become a dignified and even fashionable pursuit that our universities cannot afford to overlook. Wide acres are being set aside for the cultivation and testing of species and varieties which, in the improved forms that they can undoubtedly yield in the near future, will recoup man economically for the shameful waste that he effects in war. And in all of this advance the grape-vine has merited a full share of attention.

If at this stage in our lecture we try to estimate its importance to man during recent decades, we would say that its culture has spread westward during the past century to California, to the republics of South America, to South Africa, Australia, New Zealand and the Pacific Islands. The production of wine alone throughout the world has averaged close on 3,000 million gallons, about one-third of which has been produced by France; the trade in currants and raisins represents annually many millions in wealth, for California during recent times has produced at least 100 millions of pounds each year; while during the past quarter century the acreage devoted to the rearing of table grapes of the European type, or of its hybrids, has increased greatly, and for California represents about 50,000 acres.

Let us now turn to another and, for us here, a very remarkable history. As you are doubtless aware, Fiske, Storm and other historians have advanced strong reasons for the view that America was not discovered to Europe by Columbus, but

almost surely by the adventurous Norsemen. It would be superfluous now to cite all the facts advanced in favor, but that they called the great western region "Vinland" because there they gathered an abundance of the "Vinber" or wine berries, has favored the view that down even to Rhode Island, if not further south, the hardy voyagers penetrated and gathered berries of some native American grape-vine along the shores visited. Fernald, however, has recently suggested the view that Newfoundland and Nova Scotia were the likely regions visited, and that the vinber were berries of the northern rock cranberry. The question, however, is by no means settled. It brings before us at least the first possible contact of white men with our now celebrated native grapes that already have a great history behind them and a potential future of brightest promise.

If the Norsemen during their visits in the early years of the eleventh century actually discovered the above, they left no practical proofs in cuttings, fruits or seeds that were carried home by them and survived. Even for several centuries after Columbus' visits only minor attention seems to have been given to the native grapes, for the Dutch, the English and the Spanish settlers along the eastern seaboard, as well as the Spanish priestly fathers along the western American shores, bravely endeavored to introduce and naturalize the European species. Along the shores of the Hudson, the Delaware and other of our rivers the effort seemed only to meet with failure. No plant breeders' association existed, no state or university aid was near. So the hard-working, thoughtful battler with life's problems, the man from amongst the masses, had to carve out his destiny in this as in most other lines.

The native grape-vine heritage of our woodlands was an exceptionally rich one, for throughout the Northeast States occurred the summer grape (V. aestivalis), the fox grape (V. labrusca), the blue grape (V. bicolor), the chicken grape (V. cordifolia) and the frost grape (V. vulpina). In the sunny South were the Muscadine, Bullace or Scuppernong grape

(V. rotundifolia), the sweet mountain grape (V. monticola), the red grape (V. rubra). In the West were the Canon grape (V. Arizonica), the valley grape and others that all awaited man's efforts to advance each to higher estate, as he had already done in Europe. And here be it noted the dominant superiority of the Caucasian or Iranian race in the great evolutionary advance of the world spontaneously asserted itself. For from all our present knowledge it seems absolutely correct to say that were as much effort and care exercised by man now on those native types as have been expended on the one species from Irania and southern Europe, the results would be at least equally valuable and pronounced. It is largely to the hustling New Englander, however, that we owe most of the finer varieties of native origin whose fruits are now flooding our markets in autumn.

But while attention was being given to the improvement of these, a disastrous and unlooked-for rôle of events started in southern France. Parasitism, disease, decay and death constitute a connected chain of activity that has proceeded to our accurate knowledge in this world for many millions of years. Some plant or animal by graded stages becomes accustomed to depend on and live at the expense of another. The functions of the latter are upset, the nourishment is withdrawn, its vigor becomes reduced, decay sets in and death sooner or later follows. And the source or breeding ground of the invader is often far removed from its most destructive area. Living it may be at first on the decaying leaves or twigs of a related species to that ultimately preyed on, even far removed from it at times geographically, a quality of food supply is established that paves the way for parasitism on a related species. The formation of a connecting tongue of land, the passage of some organism that bears the minute spores of the future parasite with it, heavy winds even blowing from one area to another, may convey the organism that is to spread death. The palæontologist is at times puzzled to account for the apparent sudden and wholesale destruction that has overtaken species,

genera, even tribes of plants and animals in the past. The data are gradually being gathered that shall enable us in some degree to explain the problem, and the grape-vine yields such in part.

Up to the year 1845 the European vine had been singularly free from destructive pests. Though disseminated and cultivated by that time from China to Spain, it had remained a sturdy grower and a prolific fruiter. But some American grapes, or possibly even some other importations from this side, carried with them the minute spores of a microscopic fungus that is now too well known as the grape mildew. It appeared near Paris in 1848, and within five years thereafter had invaded the whole continent and even ravaged the Madeiras. Whitish areas on the young leaves were followed by like patches on those older, and later by brown spots on the fruit. Decay and dropping of the leaves and fruit followed. Lime or flowers of sulphur, separately or together, when scattered over the infected parts checked or even eradicated the disease in some quarters. The very susceptibility to this disease caused considerable attention to be given to native American vines in Europe, for these seemed to be more resistant than the European species. But in the importation of these, between 1855 and 1860, a more terrible pest was unwittingly conveyed as the grape louse or Phylloxera, whose life history seems to stamp it as the ideal scourge of the grape-vine.

To condense this history shortly, inconspicuous "winter eggs," laid in autumn by the female, and that strikingly simulate the grape bark are laid in fissures of it. In April these develop wingless females that make for the opening bud and, burrowing in the young leaf substance, give rise to small gall swellings, within which are deposited virgin or parthenogenetic eggs. These, on hatching, give rise in part to organisms like the parent mother that live in like situation; but, worse still, others move downward, burrow in the soil and reach the vine roots. By a proboscidiform beak a hole is drilled into the living root tissues, and there the animal lives, pumps out the

circulating liquids and proceeds to deposit a new crop of parthenogenetic eggs, which hatch out in a few days and start to imitate the mother in their attacks on the roots.

Needless to say, the vines become dwarf, their leaves become discolored and short-lived, the fruits largely or wholly fail to set. So within thirty years after introduction of the insect, France alone had suffered a loss during that time of about two billions of dollars and seemed face to face with bankruptcy in its vineyards. But the botanists Planchon and Millardet energetically studied the disease and tried to discover possible remedies. Before referring to this, however, it may be added that Phylloxera rounds out and still further complicates its life history by producing successive crops of root-sucking descendants, so it has been calculated that by the end of September one brood mother of early April has twenty-five millions of young to its credit. Meanwhile, from some of the eggs over the roots larvæ hatch that rise to the light, develop wings, fly to the vines above and there lay a small crop of parthenogenetic eggs. From some of these appear wingless males, from others wingless females, and in due time the latter deposit a fertilized egg on the bark that is to be the winter egg from which we started.

With such a life history before us it need not surprise us to find that insects, in adapting themselves during long ages to changing environment, have branched out into a wealth of genera and species that far excel those of any other group.

Having such an omnipresent foe to deal with in the air, on the leaves, in fissures of the bark, concealed even beneath the ground, it was to be expected that grape culture would suffer a serious check and that wine production would equally suffer. The latter, in one of the French communes, dropped from 220,000 gallons in 1867 to 1,100 gallons six years after. But thanks to the botanist Millardet, the land that had furnished the insect scourge supplied also the promising antidote.

Grafting of one type of vine on the stock of another had been practiced for many centuries. Millardet noticed that the

roots of the American vines seemed immune or proof against the American Phylloxera, and this, in all probability, through a long-drawn and silent battle between native American grapes and their neighbors, the Phylloxera. Countless vines doubtless died in the strife, and this probably over large areas of the Western States. But some, containing in all likelihood a protective substance that warded off the attack of the insect, as do the volatile oils of the scented Labiates, the powerful alkaloids of the potato alliance, the needle crystals of the lily and other families, became resistant and, therefore, surviving individuals by a stern process of natural selection.

The use of American stocks with insect-proof roots occurred to Millardet, and the experiment has proved a splendid success.

But only after Phylloxera had girdled the world with its ravages did the remedy come. So the loss to humanity by this one pest has been inestimable. Even here, however, the battle did not end, for equally amongst European as amongst highly cultivated American grapes the leaf blight and leaf spot, anthracnose and black rot, downy mildew, as well as the older powdery mildew, all tend to appear when certain climatic conditions favor their development. Truly alongside such minute and countless fungoid assaults it might seem impossible that even one grape-vine individual could survive. And doubtless in the bygone millennia, when man left no written history of the silent warfare, wholesale extermination over wide areas may have occurred. But co-operative relation between the prolific grape-vine and aspiring man, as between two good organic agents of the world, have turned the tide of battle against Phylloxera and the fungi, in favor also of the higher organism. Those of you who have been transported by train through the extensive vineyards of France, Germany and Switzerland, or the even greater ones of the Erie Lake region in early July, must have noticed the bluish-white tint of many green grape leaves, or may even have seen the vinedresser at work vigorously spraying his vines with the now-renowned Bordeaux mixture, a heritage and a fungoid antidote from a

French scientist already named. Biologically the sulphate of copper and the lime thus applied creates a chemical environment in which growth of the fungi is difficult or impossible. And the keenness of the contest is shown by the need of three to five sprayings a season, from mid June to August, if the fruit crop is to prove rewarding.

Let us now try to gain some estimate of the quantity and value to man that the grape represents. Possibly the mind may grasp this the better if single individuals are first dealt with. It surprised the speaker last summer to discover that on a lone but rather large native white vine in his garden, which covered a trellis of about 200 square feet, 570 bunches of grapes were produced, of which 250 were duly "bagged" for protection against wasp puncture—itself another warfare for the viticulturist. But those of you who have stood beneath one of the ample roof trellises for the Scuppernong grape by some Southern home know that my harvest was a poor one in comparison.

It is, however, when we learn as to the product of some old European vines that we begin to realize how prolific the grape is and how rewarding to man. The Hampton Court vine was planted in 1769, and when about 100 years old often yielded 1,500 bunches, with a total weight of about half a ton. The old Winsor vine trained like the last, under glass, has produced 2,200 clusters, each weighing averagely a pound. So the single plant that would cover about one-eighth of an acre yielded a ton of produce in a season. Unless in the case of the unmatchable banana, nature could scarcely prove more bountiful than this.

But in the growing of the native as of the European grape in the open, the tendency has been to develop moderate-sized plants that are annually cut back or pruned. The well-known Concord grape, that originated within sight of Emerson's and of Thoreau's home, will produce an average of fifty clusters, each weighing a good quarter pound, or a total crop of about fifteen pounds. If 150 plants are set out to the acre, a ton of fruit would thus be secured.

But two tons or even more have been obtained in a good season specially in the South, while with European returns before us it is not too much to expect that four or five tons may be secured. So nature and plant life are bountiful benefactors when man's efforts are attuned harmoniously with both.

To the writer it has often seemed remarkable that grape cultivation under glass should not have been extensively practiced in this country. Our clear suns, usually cloudless skies and warm days from May to October seem co-operating factors which, when tempered or modified under glass if extremes threaten, would ensure splendid results. Twenty years ago we ate large delicious greenhouse grapes that were reared under glass in what is now a residential part of West Philadelphia; but they were ripened by a venerable gardener who came as a young man from north Ireland and brought with him a love for his plants, a constant interest in their welfare, and an inherited knowledge of the many little devices that ensure success.

Mention of this brings up the great and truly academic question of how a wide and sound scientific knowledge can be obtained of plant life and its relation to human welfare and progress. We highly educate our medical students so that they may in time combat human ills, we equally train our legal aspirants so that they may at least try to settle human quarrels or wrong-doings, we require years of preparation from the future clergyman who is to interpret for us religious thought, but in what constitutes the most far-reaching, most basic, most intricately scientific and most enriching support of human life—namely, our study of plants in every relation to each other and to human welfare—we still largely leave it to haphazard effort and rule-of-thumb practice. True, this country has excelled all others in the establishment of colleges and stations where much valuable scientific work is being carried forward; but there is yet needed a great botanical college centered in an educational and experimental garden of 500 acres, directed and taught by a staff of at least fifty

experts, all of them well grounded teachers and specialists in varied fields; attended by a band of earnest students, whose high aim shall be to acquire funds of learning and to add to the stock of human knowledge. I speak what shall yet come to pass somewhere. Will it be under the shade and fostering spirit of "Old Penn?" This is a question that vitally concerns us.

We are here picturing and prying into the future, an ever-delightful occupation when the prospect seems fair. What then, it may be asked, does the future suggest for the grape-vine? Hybridization of varieties and species has been successfully practiced during the past quarter century, and some of the Southern types, like Letoney, Carman and Blood, promise well. Skilfully selected hybrids also may in time yield us fruits of greatly increased size and largely or wholly seedless within. For, if the banana, the orange, the pineapple and other fruits that may be wholly seedless are to constitute a criterion, it seems almost assured that not many years hence a grape type may arise by intensive cultivation, selection and propagation which will yield a seedless grape. And on the botanical principle of growth compensation a considerably larger fruit, with even richer content, may then be expected.

Again, from the standpoint of species variation and hereditary transmission of variation tendencies, it seems likely that the future may bring greatly more for us than even the past has done. Those of you who have inspected the nurseries of skilled viticulturists know that the form, color, hairiness and texture of the leaf in different varieties vary much for the American as for the European grape. The color of the fruit in the latter may range from the deepest blue-black through purple-crimson and flesh to yellow-green or gas-green; the size in the European species may range from a quarter or three-eighth inch across, as in the currant grape, to the huge black berries of Gros Colmar that may be one and a quarter inch through. We still are largely ignorant as to the predicable causes that bring about such variations, seeing that each plant

is exposed to the many environal factors of sunlight, heat, wind, moisture, soil constituents and soil consistence at least, any one, or some, or all of which combined, may effect potent changes. But when the Continental catalogues name and describe 267 varieties of the one European species, and nearly as many are already recognized of our few hitherto cultivated native ones, this is ample proof that variation is and has been an inherent tendency.

Till the acceptance of the principle of evolution we were wholly in the dark as to why any plant varied and, not least, why, under man's selective care, the degree of variation might become so pronounced as often to leave us in doubt as to the aspect and geographic center of the wild type. Even after acceptance of the principle itself, biologists largely failed to realize that environal factors are the prime causes of change, and that, as the sensitive plant raises or expands its leaflets under varying intensities of light, every plant more or less sensitively responds for better or for worse to every stimulus that plays upon it.

In our day the botanist, like the zoölogist, can claim that even the moderate share of interest and support accorded to his subject has enabled enormous advances to be made in our outlook on life in its widest phases, on our interpretation of the interrelations that exist throughout the whole organic world, on the means by which man can guide and often even govern these inter-relations so that they may benefit and bless instead of injure and destroy.

If then, in the past history of man's relation to the grape-vine, it can be shown that his efforts—often wavering, groping, uncertain and unscientific—have already accomplished so great results, surely it becomes us all to take this and many like objects of culture as examples of encouragement, and by liberal appreciation of scientific effort—even of the most practical and applied kind—to advance all investigation that may be directed to such ends, assured that in aiding this we are greatly enriching ourselves.

THE EXCEPTIONAL CHILD AT HOME AND IN SCHOOL

By Lightner Witmer

Professor of Psychology and Director of the Psychological Laboratory and Clinic, University of Pennsylvania

The study and treatment of the exceptional child is an outcome of two periods of rapid progress within the science of psychology, the one in the latter part of the eighteenth century, and the other in the latter part of the nineteenth century.

As early as 1744 Pereire demonstrated before the academy of science at Rochelle that a congenitally deaf child was not necessarily mute, and could be taught oral speech. His success was due to a better understanding of the anatomy and physiology of the language function and in turn contributed results which led to a further advance in our knowledge of the development of language, more particularly in the individual but to some extent also in the race. In 1771 the first school for the deaf was established in Paris. In the last decade of the eighteenth century Itard made at this school for the deaf the first recorded experiment to train a feebleminded child. About the same time written language for the blind was invented, and schools for the blind came into existence. In the early part of the nineteenth century, training schools for moral delinquents were being established in Europe and in this country.

Although this pioneer work in applied science was done over a hundred years ago, society has been slow to seize upon the opportunities thus offered for the efficient treatment of these and other classes of defective children. Institutions for the training of the blind naturally were developed first, because the education of the blind child is a relatively easy task, and the blind may be more nearly restored through scientific train-

ing to normal social intercourse with their fellows. The schools for the deaf in this country did not begin to teach oral speech until 1867, and to force them to undertake this work a radical group of trainers had to establish a school of their own. In 1850 through the efforts of Seguin, inheritor of the scientific work of Pinel, Itard and others in France, schools for the training of feebleminded children began to be established in this country. The efficacy of the scientific training of blind and deaf children can be estimated from the brilliant results of the training of Helen Keller. The efficiency of certain schools for the training of feebleminded children, as for example the Pennsylvania Training School for Feebleminded Children at Elwyn, presided over for a brief period by Seguin himself and then by Dr. Kerlin and Dr. Barr who have preserved and developed the Seguin traditions, has always been maintained at a high level. These schools, however, are so few in number that they constitute scientific outposts only, outposts behind which there is no army. They afford, as it were, a *sample* here and there of what society with the assistance of science *might* do for this class of exceptional children. They fail adequately to provide for the training of the vast majority of these children. Houses of refuge or reform schools for moral delinquents have not on the whole been infused with the same scientific spirit and knowledge as have schools for the deaf, blind and feebleminded. This is probably due to the fact that science itself has not been in a position until recently either to investigate the moral delinquent or to propose definite measures of remedial treatment. These schools also have been overfilled with children, and the greater number of children requiring special disciplinary training are to be found beyond the walls of these schools.

The second movement for the study and educational treatment of exceptional children was inspired, or at least made possible, by the development of modern science, especially psychology and hygiene. It began about the year 1890 in this country, and was the result of the introduction of school

medical inspection, the enforcement of compulsory education, the failure of society to provide for the care of the blind, deaf, feebleminded, and delinquent children, the development of a type of applied psychology now generally called clinical psychology, and lastly the increased efficiency of public school administration, which led to the discovery that millions of children in the United States were not obtaining the elementary education which they were supposed to be getting and which a democracy insists is necessary for self-governing citizenship.

The earlier movement for the training of exceptional children was not conceived of as a part of the problem of general education. It was in part a scientific movement and in part a humanitarian movement. To some extent also it was a blind effort of society at self-preservation by removing from society (temporarily at least) certain unfit elements. The later movement for the educational treatment of exceptional children is a part of the public school problem. It represents a conscious effort to introduce scientific procedure into common school practice. It has had and will have far reaching consequences not only upon educational practice with respect to all children, but also upon the development of the sciences of psychology and hygiene. It led directly to the founding of psychological clinics at the University of Pennsylvania and other institutions of learning, and to the establishment of similar clinics in connection with the public school systems of many cities. It evolved the Montessori method, and this in turn is producing already a rapid change in the principles and methods of kindergarten practice.*

I have taken part in this movement for the more scientific treatment of exceptional children from its inception in this country, and from the beginning I have been inspired by the belief that the study and training of the exceptional child constituted the most favorable point of approach for a psy-

* Read in this connection Miss Palmer's recent article in the *Kindergarten Review* on "Problems versus Subject Matter as a basis for Kindergarten Curricula."

chology applied to educational practice. I confess that I did not foresee and I am astonished at the rapid development and extensive ramifications of this work. Not the least important result of the movement is the bringing together of the parent, the teacher, the school administrator, the college professor, the university research worker and men of science representing diverse branches of knowledge.

The problem of the exceptional child confronts us in the kindergarten, in the grade class, in the high school, in college, and in the graduate school. To solve this problem we must treat each pupil as an individual, a unique psychological entity. At home every child is an exceptional child, at least in the fond parents' estimation. At school, where children are treated in groups called classes, they are necessarily considered to be very much alike. Class instruction is pitched to the probable capacity of the average or normal pupil. The exceptional pupil who cannot do the work of the class, no matter how hard he may try, is considered somehow abnormal. Even the exceptionally gifted, who so often provide difficulties for the rigid classification of the educational system, are looked upon with suspicion and some concern. They are often dubbed precocious, and precocity many believe to be a dangerous symptom of a too early maturity and forthcoming decadence.

The modern clinical psychologist who is pushing his investigations into ever new fields of human behavior, maintains an attitude toward the child, which approximates more nearly that of the average parent toward his own children, than that of the class teacher. Every child is potentially exceptional. Deviating types of children,—idiots, imbeciles, feebleminded, retarded, dements, deaf, blind, mute, diseased, and even the highly gifted children, are naturally first separated from the undifferentiated mass of ordinary or normal children. The deviate's mental, moral, and physical characteristics are more easily observed and described, and the relationship of cause and effect in the molding of character more readily ascertained.

Those who remain, the so-called normal children, are a continually decreasing number, for nearly every child when carefully studied is found to deviate in one respect or another from this hypothetical and least understood normal child. And even this residual normal child is an individual. His mental status is unique, his life history differs from that of every other normal child. Even in the same family children possessed of the same heredity and living in the same environment differ very greatly in personal characteristics and respond very differently to the same course of treatment.

Clinical psychology in short is individual psychology. Wherever individuals are taught, a problem is set for the clinical psychologist. I do not, however, intend to imply that the clinical method of approaching educational problems is the only method. None the less I have believed for some time that it is the most fruitful method of approach, for both psychology and education, if for no other reason because the clinical method is needed to break the ground for the cultivation of other more refined psychological and educational methods.

If the training of exceptional children is a scientific problem, and their education is a bit of applied psychology, then the training of teachers for exceptional children should be a central motive of the university department of psychology, determining the policy of the department with reference to original research as well as with respect to the organization and conduct of courses in psychology for college and graduate students. What an exceptional child may be, in the sense in which I am now using the word, and who is the teacher whom we are to train, are questions which I desire to make clear within the limits of my paper this afternoon.

At the December meeting of the American Psychological Association in 1896, I outlined a program for the application of psychology to the diagnosis of normal and exceptional children and to the training of teachers. An educational problem which I saw then confronting us unsolved, still confronts us

unsolved, despite the fact that much has been accomplished in the intervening years. The "backward" child I then defined as a child who is behind the grade in which he should be. He *might* be feebleminded; he might, however, be precocious, unevenly developed, a disciplinary case, of foreign extraction, attending school irregularly, possessed of physical defects not necessarily severe but potent in producing a retarding effect. The fact of pedagogical retardation is now an admitted commonplace of school administration, rising in some places to 50 per cent of the school population. Classes for backward children, orthogenic classes, ungraded classes, are now to be found in all our large cities. In many cities, specialists like Miss Farrell in New York, Dr. Cornman in Philadelphia, and Dr. Hill in New Orleans, are directing the classification and educational treatment of these children. Nevertheless, despite tentative efforts here and there, little has as yet been done for the backward child in the sense in which I originally defined him.

Imagination only too readily outruns accomplishment. It is easy enough to propose a problem and offer a solution, expressing our results in the terms of scientific imagination. When we come to put our scientific program to the acid test of experience, we are likely to find either that it does not work, or that it works in ways we did not expect. What has been done for the backward child and other types of exceptional children, amounts as yet to very little because we have not been able to mobilize our forces to attack this special problem, first because we do not have teachers adequately trained to help in the solution of the problem, and secondly because other problems, unexpected by many, demand solution first. Thus the term "backward child" soon came to be employed to designate a feebleminded child. This is due to the fact that parents and the public and even most teachers of these children, do not really know what feeblemindedness is. So quickly did this change in definition take place that when Dr. Ayres came to write his book, "Laggards in our Schools," he was forced to reject the term "backward" because it conveyed this false

implication. I have been compelled to use a new term, to speak of a "restoration" case, in order to emphasize the distinction between a child who is temporarily behindhand and can be restored to the grade in which he should be, and the child who is permanently defective and must fall relatively farther and farther behind his fellows. In some places too, boards of education used classes for backward children for the purpose of appointing teachers who could not obtain a teacher's certificate for ordinary grade work. Many of these conditions have been happily remedied. It is now a firmly established principle that these classes should be organized in every school system with a school population of two or three thousand, and that the teachers of these classes should be given a special professional training. Nevertheless confusion still exists as to the character of the children composing these classes, as to the difference between a mentally defective child and a child with mental defects, between a permanently subnormal child and a restoration case, between a feebleminded child and one who is merely handicapped.

From the first I have tried to make this distinction clear, but over and over again I am compelled to repeat that the Psychological Clinic is not intended primarily for feebleminded children, and that clinical psychology in the schools does not concern itself exclusively or primarily with mentally defective children. Only last winter Mr. Courtis tried to distinguish between an educational clinic and a psychological clinic, drawing the line at a hypothetical point where he turned over to the psychological clinic the subnormal and the abnormal, leaving to the educational clinic the hypothetically normal children in ordinary classes. It is perhaps a matter of indifference whether we call a given type of work an educational clinic or a psychological clinic. It is of importance, though, to recognize that Mr. Courtis is now working out in the school room by ingenious methods of his own, exactly the same problem which we are attempting to work out at the University of Pennsylvania in the Psychological Laboratory. Every class room may

be a psychological clinic, if a clinical psychologist is in charge of it, and the teacher or supervisor becomes a clinical psychologist when he treats his pupils as individuals, adapting individual educational treatment to the differentia of the psychological diagnosis. I prefer to designate this work clinical psychology rather than clinical education, because at the present stage of our scientific development, diagnosis in itself is more important than treatment. Mr. Courtis puts forward his diagnostic tests as a means of differentiating the educational treatment. Even the careful parent will determine to punish or not to punish and will select the mode of punishment only after he has made a differential diagnosis of the child and the conditions surrounding the offence. If then he makes the punishment fit the child, he has acted throughout like a clinical psychologist. But if he is concerned only with the offence and above all if he believes "on principle" in certain definite methods of punishment to fit particular offences, he will be acting like a Simon-pure educator. Of course the parent is somewhat of both, with perhaps an admixture of the common man uncontaminated by either psychology or pedagogy, who flies out at the child merely in anger or vexation of spirit. Always the public will respond enthusiastically to those who acclaim the merits of new and old nostrums. This is as true of education as of medicine. The unscientific world still believes in the universal efficacy of educational methods. In both medicine and education, however, progress will come through the development of those sciences which supply the basis for a differential diagnosis. Remedial treatment must be carried forward always with a view to perfecting and checking our diagnosis. Psychology through its many ramifications is the science upon which education must rely for the mental diagnosis which we clinical psychologists believe should be the starting point for the application of educational methods.

It is true that our psychological clinic sees a large proportion of feebleminded children. Of a thousand analyzed cases, 50 per cent were diagnosed as feebleminded. Of the remain-

ing 50 per cent the diagnosis was "normal," tentatively normal, or deferred. It is probable that a large percentage of these cases were also feebleminded. Nevertheless the feebleminded have, as it were, been forced upon us, as they have been forced into classes for backward children in the public schools.

The Psychological Clinic is a public service institution, to assist parents and teachers, as well as a department of research and instruction. We try to relieve by helpful advice the burden of the parent or school afflicted with the feebleminded child, just as the physician may seek to alleviate the suffering of a patient known to have an incurable disease. The cases which I consider real clinic cases are those children whom the lay public would call normal children with handicaps or defects, or children on the borderline, especially the puzzling, doubtful cases. The first case which I saw at the Psychological Clinic in March, 1896, for example, was a boy fourteen years old in the fifth grade, two years behind grade, of normal intelligence, an exceptionally bad speller, who read about as well as a child in the second grade. His specific retardation in reading and spelling as well as his pedagogical retardation of two years, was due to an eye defect. The ascertainment of this fact was the task of clinical diagnosis. When the boy had been sent to an oculist and his eye defect corrected, he could neither spell nor read any better than before. To teach a fourteen year old boy to read and spell, was a problem for clinical treatment, and the outcome enabled me to decide whether the boy's retardation was due to the eye defect or to some other cause. Before this time, while teaching in a college preparatory school, I was called upon to prepare in the English branches a boy in the year preceding college, who was literally unable to write a single English sentence correctly. In attempting to teach him English composition, I discovered that he wrote as he talked, and I arrived at the conclusion that he could not learn to write until he had first been given a satisfactory training in articulation. I believed also that the retardation in the development of the language function had caused a retardation

in the development of his powers of thinking. This boy subsequently went to college, taking five years to do four years' work, and later graduated with great difficulty from the medical school. He is now a physician in active practice. His intelligence is normal, perhaps above the average, for he has succeeded in getting along despite a severe handicap.

More recently a boy of ten was placed in my professional care for educational treatment. After fifteen months of special training he was placed last year with boys of his own age in a college preparatory school, where he began the study of French and Latin. He was promoted to the next higher class at the end of the year, and during the year he was in the highest honor group of the school. I cite these cases not for the purpose of showing what can be done by appropriate educational treatment, but to present the true problem as one of diagnosis. I disclaim having knowledge of any educational methods which the profession does not already possess. Results in educational treatment flow from a selection of the methods, the selection being based upon a scientific diagnosis, which must be made not only at the beginning but continuously throughout the course of treatment.

The vagueness in the public mind as to what constitutes normal mentality, and what is abnormal, is founded upon a similar vagueness of scientific opinion. There is no so-called normal person who does not possess some mental defects as well as mental assets. Because a child has one or a few mental defects, we must not characterize him as a mentally defective child any more than we consider a child to be physically defective who has an eye defect, such as astigmatism or hyperopia.* Of course he is not physically perfect, nor is any child physically perfect. By the same token no child is mentally perfect. In fact, the child of perfect mind and body would be a rarer specimen than the idiot, the lunatic, or the criminal.

* The athlete who first established an intercollegiate record in the running high jump of over six feet, had taken up jumping on the advice of an orthopedic surgeon because of a "game" leg. Neither a physical nor a mental defect necessarily means permanent inferiority.

Undoubtedly there are children whom we may properly designate mentally defective children, but the line cannot be sharply drawn between children with mental defects and mentally defective children. The defective child is one who has so many and such severe mental defects that he cannot overcome these defects as a result of expert training, and must therefore reach adult age inevitably arrested in mental and moral development, industrially incapable of earning a livelihood, and socially a burden, perhaps even a menace, to himself and his family or to society, either by virtue of his own behavior or his capacity to reproduce his kind.

We therefore define the feebleminded child as a result of social considerations. He is the child who for his own good or for the good of society and his own family must be segregated for life. It is immaterial for our definition whether this segregation be maintained in the family or in an institution. A casual glance may suffice to assure us of the mental and physical status of some feebleminded children. But there will always be large numbers of children in the border zone between the socially normal child and the socially feebleminded child, and with such children the refinement of clinical methods and the application of intensive methods of observation and training must provide the psychological data necessary to arrive at a sound social classification. What characterizes feebleminded children, therefore, is not that they are mentally defective, for other children, in fact all children as well as all adults, are mentally defective in one way or another, but that they are *so defective mentally as to be socially unfit.* For the term "mentally defective," I have therefore preferred the term "socially unfit," or "socially defective."

My first efforts at a statistic of retardation were employed for the purpose of finding out how many children possessed so many and such severe mental defects as seriously to interfere with normal development in the home and in school, whose defects nevertheless could be made to yield to appropriate orthogenic treatment, and the child if actually overage for

grade, restored ultimately to his proper grade. I have never been able to obtain satisfactory statistical data bearing on this question. Reliable statistics will be obtained only when the grade teachers become clinical psychologists, or Mr. Courtis extends his methods to afford a general as well as a specific diagnosis. In the summer of 1897 I organized a class for backward children in connection with the summer school session of the Department of Psychology. This class contained many children who were feebleminded and incapable of being restored to the grades. We have since then conducted many classes, but never at any time have these classes been composed exclusively of backward children capable of restoration to the grades and to the social status of the normal child. This situation is repeated in the classes for backward children in every school system in which they have been established in this country. I venture to say that 90 per cent of the children in the orthogenic classes of Philadelphia and the ungraded classes of New York cannot be restored to the grades in which they should be according to age. These children are permanently defective, *i. e.* feebleminded, and all our institutions for feebleminded children contain cases of as low and as high mental grade as they. Are we to look forward to the education of feebleminded children in the day classes of our public schools? Institutions for feebleminded children have been in existence for more than fifty years in this country, and many of them have been carrying on educational work of scientific character. This newer movement for the clinical examination and treatment of backward children has no *raison d'être* if it is conceived to be limited to the backward child in the sense of the feebleminded child.

The exclusion of feebleminded children from the public day schools is beset with many difficulties. No state makes adequate provision for their training, not even for the custody and care of low-grade imbeciles and idiots. The Pennsylvania Training School for Feebleminded Children, as its name implies, is a school for such feebleminded children as can be trained.

As a matter of fact this institution contains more custodial and untrainable children than trainable or educable children. It is now making a justifiable effort to limit its work to educable cases, consequently I see in the classes for backward children in the city of Philadelphia, and even in classes for normal children, children who would be rejected by the Pennsylvania Training School for Feebleminded Children on the ground that they are not educable. I know devoted teachers who are spending their time and energy trying to educate children whom experts consider uneducable I believe that at least 25 per cent of the children in classes for backward children are in the proper sense of the word not educable, and that it is a waste of effort to teach them reading, writing, and arithmetic.

I do not propose to debate the question as to whether it is desirable for a public school system,—an institution which is primarily educational,—to spend more *per capita* on trying to educate uneducable feebleminded children than it does on educating normal children. I have an open mind on this as well as on many other questions of public concern. I believe the public school system is an educational system whose functions are not limited exclusively to its pupils. The schools must educate public opinion, parents, and above all the teachers who are doing an active service in this work. Low-grade imbeciles in these special classes may thus serve, without much harm to themselves, as psychological specimens for the enlightenment of professional and lay opinion. Even the effort to teach them will be serviceable to the teacher, provided the teacher is capable of learning from failures and is sufficiently trained in scientific principles to know a fact when she sees it and to report the fact with conviction to the proper authorities.

The public school situation then presents us with special classes in which there are some children who are merely custodial cases, some who are trainable (they can be trained to use their hands and even to contribute thereby more or less to their support), and finally some children who can even learn to use reading and writing as tools for their educational develop-

ment. Do the classes contain many true restoration cases? I doubt it. The administrative problem is primarily one of classification, based on sound diagnosis, for the lower grades of these children do not require an expensive expert teacher but a caretaker or nurse. The higher grades of feebleminded children in our schools for backward children, require a teacher trained in manual methods, who will minimize the academic work. What one sees all too frequently, is a teacher whose training has been primarily academic, engaged in the hopeless task of teaching reading, writing, and arithmetic to children who can never use these processes as tools for their further development. If these children are to be retained within the school system, and I believe they will be retained there for many years to come,—the training of the teachers must be devoted largely, perhaps exclusively, to training in the technique of manual work, dancing, occupations, etc. Certainly a year's time must be devoted to this technique, and this training of the teacher may perhaps be superimposed upon a normal school course as an additional or graduate year.

While this training will be adequate for the rank and file, we need even for feebleminded children in the public schools a group of scientifically trained teachers who will act as supervisors and render valuable assistance to the expert clinical psychologist in making diagnoses. Moreover the number of feebleminded children in the public schools, great as this number is, must be less than the number of doubtful cases on the borderline. The number of mentally defective children must be less than the number of children with mental defects. To take only one small group, the number of deaf children requiring articulation training is much smaller than the number of children in the public schools who have normal hearing and normal mentality but manifest some defect or arrest of speech development requiring special articulation treatment. For every articulation teacher required for deaf or feebleminded children, there should be *one plus x* teachers of articulation for normal children.

"How many children have mental defects?" can be easily answered from the theoretical standpoint. Every child has one or more mental defects, which is simply another way of saying that no child is mentally perfect. Whether a child has a defect sufficiently serious to warrant a teacher or parent spending some time upon its amelioration or elimination, is in my opinion a question which can be answered only after an expert diagnosis has been made. That the public school system and even our colleges will make more careful diagnoses of their pupils in the future with a view to remedial treatment, I believe to be certain. The training of teachers for the training of feebleminded children or defective children in the public schools, important as this educational movement may be, is of relatively less importance than the training of expert teachers capable of making diagnoses and treating their pupils on the basis of such diagnoses. The training of this kind of teacher for exceptional children must in my opinion take its rise in our universities. I consider it the privilege, nay the necessity of the university department of psychology to provide for the training of these teachers.

When I was a member of the first graduate class in psychology at the University of Pennsylvania, conducted just twenty-five years ago by Professor James McKeen Cattell, there were four students, of whom one was a student of philosophy and two were clergymen. That three-fourths of the class were not primarily interested in psychology at all, presents a situation which was common in that day and which unfortunately still persists in some institutions to the present day. Philosophy, in a few colleges, still keeps a palsied senile hand upon the youngest of the sciences, and as long as this condition lasts we shall not be able to gain those whose aptitudes and social enthusiasms fit them for work in applied psychology. Even in institutions where psychology has been freed from this cause of arrested development, it still must find its clientele of students, make its appeal to men and women interested in psychological problems and inspired by the belief

that discoveries within the science of psychology will have results of practical value to mankind. After twenty-five years the science of psychology is generally recognized as an independent subject. There is indeed almost too lively a faith in its ability to solve practical problems; too frequently the child of promise is hurried to a premature birth by the forcible use of instruments. Binet testers claim to give the exact mental status of a child of any age, although anthropologists cannot tell us even his height and weight without large variations.

Psychology is now just about to enter upon the phase of development upon which chemistry as an applied science entered some fifty years ago. It is a matter of first importance to build upon a solid foundation of accomplishment, not to anticipate the future, but to make the future secure. Elementary motives from this point of view are first to get students, and then to train them adequately. Psychology never will make good its promise of social service, unless we do more than train university or college professors of psychology. Psychology is related to education and the social sciences,—among which I include law,—as physiology is related to medicine. It has a content which is basic for education and the social branches, but above all its appointed task is to train the student in scientific method and to inculcate the spirit of science. My thought is that the department of psychology in a college or university should have an opportunity equal to that of the other sciences to win to its cause intelligent students with strong social impulses. I believe, however, that safety admonishes us to take one step at a time. The practical application of psychology in law, in medicine, in criminology, and in the social sciences, is theoretically possible, but before this application can be recognized and psychology become part of the training of candidates for these professional careers, it must demonstrate its importance in that field where its practical value should be greatest,—the field of education. A sound policy inspired Stanley Hall, Cattell, and Thorndike to

devote themselves to the organization and development of the applications of psychology to education. I have endeavored also to work out the same policy, although along somewhat different lines.

In brief, my thought has been that if education is to become a learned profession, and like medicine secure a recognition commensurate with its social value, educational practice must rest upon a scientific foundation in psychology. On the other hand, if psychology as a department of university and college instruction is to win ambitious and intelligent students, capable of being trained to employ scientific methods in educational practice, it must not be content to accept left-overs from the other learned professions. I believe there is a career within the field of education open to psychologically trained teachers, whose professional training should be superimposed upon a four year college course or its equivalent. This expert teacher is to be a trainer of backward children, *i. e.* restoration cases, and of other classes of children whose educational treatment may be put upon an individual basis. Next after the restoration cases I think the kindergarten offers the best opportunity within the public school system for this kind of expert teacher, for the problem of the kindergartner and the restoration teacher is identical. It is the adjustment of the child to the more formal work of the elementary grades. In due time the methods and results of clinical psychology may affect our treatment of even college students. As a college professor I am a teacher of exceptional children, for the college student represents but a very small percentage of the adolescent youth of the country. Moreover our colleges attract some students who are unfit to profit by the course, and the retardation of the average and supernormal pupil through the presence of the subnormal and unfit is as much a commonplace of college administration as it is in the elementary grades.

While I consider the training of teachers for exceptional children chiefly from the angle of the psychologist and the university, I do not contend that all school rooms should be

scientifically, *i. e.* psychologically conducted, nor that all teachers of backward children and other exceptional children need a scientific training. Both artisans and artists will always form important diverse elements in the teaching profession, as they do also even within the field of scientific investigation. In the recognition of this distinction should be found a differentiation between the aim of a normal school and the aim of the university. Many teachers of backward children are needed, schooled in the technique of their profession. This technique is already so varied and so extensive that one or two years of special training is required. In my opinion normal schools should provide a differentiated course for these teachers, giving them less training in the principles of pedagogy and more training in the practical art of doing things. Some of the best trainers of backward children whom I have met, have been quite innocent of the principles of pedagogy and psychology. Nevertheless it is becoming increasingly manifest that the profession of education is to be infused with the scientific spirit and will employ scientific methods. University and college departments of psychology and schools of education should limit themselves to the realization of this aim. They should not try to compete with normal schools, which are in effect technical schools for the training of the good artisan in education. They should strive solely to develop those students in scientific method who have the ability and aptitude to acquire such methods, and to apply them to new problems as they arise. To my mind the significance of the work of Hall, and Cattell, and Thorndike, and Montessori, and the progressive kindergartners, and the clinical psychologists and clinical educators, is that educational practice may be made a species of original scientific research. The university is peculiarly the institution which fosters the spirit of original investigation. All of its teaching should be done for the purpose of realizing this its primary aim. However closely the university department may adhere to this principle in teaching, it will of necessity develop more artisans than artists, for in this profes-

sion as in other professions, many may be called but few will be chosen. Nevertheless it is one of the most hopeful signs of educational progress in this country that there is already a demand greater than our universities can fill, for scientifically trained teachers. In the twenty-five years of my connection with a department of psychology as student and instructor, I have seen the science of psychology slowly evolve a few methods of attacking the problems underlying educational practice. I have seen the demand for scientifically trained teachers increase from nothing at all to a demand greater than can momentarily be filled. At the present stage of development in this line of work, university departments of psychology should seek to make those who are ambitious for an intellectual career of social usefulness, aware of the fact that here is a task worthy of many years of patient training in method.

Public service, teaching, and research are co-ordinate functions of the Psychological Laboratory and Clinic. When I ascertain a child's mental assets and defects, and when I teach him something or recommend a definite course of treatment, my purpose is a double one, on the one hand to help the child and his parents and on the other to teach myself something of the relationship of cause and effect in the molding of individual character and to contribute what I may learn to the general body of scientific knowledge. The furtherance of these activities of the Psychological Clinic is not limited to the confines of an institution. An extension clinic may be held in any locality, and if the work be properly organized and supported, extension clinics can be made to contribute to our knowledge of child development as well as to aid the parent or teacher and bring useful knowledge to the community.* No branch of learning is better adapted for university extension than is clinical psychology. Agriculture may touch every farmer, chemistry and economics many industrial workers, but psychology touches

*A Pennsylvania superintendent of schools wrote after an extension clinic in his city, "I think I am quite safe in saying that we never had a visit from anyone from whom we received more good."

literally everyone. Who is not a parent, or personally interested like a parent in the development and career of some child or youth?

Psychologist and parent are alike concerned with behavior and its interpretation. A mother and child living in the country go to the well to draw water. Each carries a bucket filled with water. Although the child's bucket is small, she stumbles over it on the way back to the house. The mother says, "Let me help you carry your bucket." The child in vigorous protest shakes herself free from the mother's helping hand and says, "No, you have got your bucket." The sentimental mother interprets the child's thought to be, "You have already your share of this hard work. Let me help you a little by carrying my own bucket." Was this the meaning of the child's behavior? Or did she think, "You are having fun enough with your own bucket. Hands off, and let me have a little fun with mine"?

Another little girl of four, who objected, as I understand some little girls do object, to being kissed, was kissed on the cheek by a woman friend of her mother's. She quickly lifted her hand and rubbed it off. The lady said, "Why, you don't like my kiss?" Like a flash the child replied, "No, I am not rubbing it off. I was only rubbing it in for fear the wind might blow it away." The parent asks, "Is this little girl a born liar, or a paragon of tact, and what does this readiness to extricate herself from a social difficulty promise for the future?" The fond parent professes interest in the comparative behavior of children and concern over what the psychologist calls the diagnosis and prognosis. Can the parent become something more than the prideful raconteur and help himself and science by reporting the significant facts of his child's behavior and development?

An encouraging answer to this question is a little book of one hundred and ninety-three pages on "How I kept my baby well." Mrs. Noyes dedicates her book to Professor John Dewey, "whose plea for the extension of methods of science

to the commonplace things of life gave me courage to believe that a mother's own baby might be a fit subject for scientific investigation by even a baby's own mother." She laments that to begin with, in spite of her college training, she was "a novice at baby culture." She says, "I cannot recall any particular instruction given me during my academic life that so much as intimated that the problem of baby raising existed in the world, but I had learned, although late in my college career, that there is such a thing as inductive thinking, and armed with the latter power I was prepared to attack the former problem." She correctly measures the necessities of the situation when she urges, "The next thing to do is to follow this record with the records of say fifty babies."

It is admitted that the home as a social institution is in desperate straits today. Is it to disappear, or can home influence be conserved as a real factor in the child's orthogenic development? Every college boy and girl may be viewed as a prospective father or mother, and must be viewed as one who is to live in a home or at least in business and social association with other human beings. The distinction between a vocational subject and a cultural subject of the college curriculum does not apply to psychology, for it is the business of everyone to acquire control over his personal resources of character, to modify his conduct with reference to the motives, feelings and opinions of his fellows, and if possible to constrain their desires and activities to further in some measure his own interests. "Know thyself," the Greek of old put forward as the motive to self-culture, to which the psychologist appends, "and others unlike thyself." Fechner, to whom more than to any other one man we owe the introduction of the scientific spirit into psychology, tells us that we need to build the science from the bottom up, not from the top down. Our college students, whether we consider them merely as prospective parents and citizens or as future members of some learned profession like education, need to acquire from the science of psychology not opinions, even though they be correct opinions, not facts, even

though they be true facts but rather a method which will enable them to discover new facts and arrive at sound opinions of their own, a method which will serve them as one of the world's most highly prized possessions, a key wherewith to unlock some of the mysteries of man's life and consciousness.

WHAT IS ELECTRICITY?

By Arthur Willis Goodspeed

Professor of Physics and Director of the Randal Morgan Laboratory of Physics, University of Pennsylvania

"What Is Electricity?" The title of this address has been expressed in the form of a question, and it may as well be stated at the outset that the question will not be answered—*i. e.*, not upon this occasion. What I am prepared to do is to outline as simply as possible the present views of science on electricity and its relation to matter, for an ultimate analysis of either involves the other. I think it can be shown that electricity is the fundamental "sub-stance" of all matter, to use the word in its strict etymological sense.

And so we shall excuse ourselves from proceeding farther into the mystery of nature than the study of what we now call fundamental—*i. e.*, in the sense that at the present moment we cannot conceive of the next step in the analysis of ultimate nature.

It will, of course, be quite impossible in the time at my disposal to give the lines of reasoning or the methods of investigation which have led up to the present-day conclusions very generally accepted. Those wishing to study the subject more in detail, I must refer to the original papers of the several experimenters to be hereafter mentioned, whose work furnishes strong evidence in favor of the views here to be set forth.

My discourse will not be ultra-scientific, but I shall try to give the layman an intelligent notion of what science has done and is doing in this special line of investigation.

We live in a wonderful age—not only relatively, but absolutely—and I refer not only to the marvelous progress in pure science, but to the most impressive results due to the successful applications of the principles of pure science to the produc-

tion of useful appliances. Within my own recollection have appeared the invention of the telephone and its adoption by the whole civilized world; the application of electricity to not only local motive power, but also to that of moving vehicles of all kinds, even the most powerful locomotives for drawing the fastest passenger trains; the internal explosive engine used on a large percentage of the automobiles now made; the useful development of the electromagnetic theory of light from the mathematics of Maxwell through the experimental demonstration of Hertz to the application by Marconi and others for the purpose of signalling at a distance without the use of any conducting wires. These and many other things could easily be enumerated to illustrate the wonderful progress of physical science and its applications during the last twenty-five years, and to treat any single one in any detail would require a year's course of college instruction rather than the single hour devoted to the present discourse.

As the recent progress of the science of electricity and its industrial applications has perhaps been the most remarkable, and contributed most to the welfare of mankind, it is quite fitting that we should consider briefly the nature of the agent which is directly or indirectly responsible for the effects produced and determine, if possible, what relation it bears to the other agencies or entities with the nature of which we feel more familiar.

Not so very long ago teachers of physics used boldly to assert that matter and energy comprise every conceivable existence in the physical world. Electricity and the ether, however, presented difficulties to this brief classification, though it was often predicted that at some time and somehow electricity would be shown to be a connecting link between ether and matter. Although this expectation has not been up to the present time realized, the accepted belief as to the relation of electricity to matter will be apparent when we have taken a brief survey of the evidence about to be presented.

Since I have referred to the ether, it seems fitting that a brief

comment should be made in regard to it. As the wave theory of light more than a hundred years ago gained ground against the corpuscular theory long held by Newton and his followers, it became necessary to postulate a medium in which the waves could be propagated. The necessary properties of such a medium to account for the special kind of wave and their high speed were listed and described. The belief in the existence of some sort of medium seemed imperative. For example, heat and light are present in the sun; eight minutes later they are received by the earth. During that eight minutes, where are they and what are they? "Radiant energy in the ether," has been the universally accepted answer till quite recently, and the postulate of the ether has been one of the fundamentals of physics. Even up to 1904, at the Congress of Arts and Science at St. Louis, physics was discussed under three heads, as "physics of matter," "physics of the ether," and "physics of the electron." Even at the present time I believe that the great English physicist, Sir Oliver Lodge, contends that the ether has a very definite and concrete reality. On the other hand, within the last few years there has been developed a new branch of philosophical physics known as "The Principle of Relativity," enunciated by Einstein, of Berne, and mathematically studied by Minkowski. In America the chief writers have been Lewis, Comstock and Tolman.

The theory of relativity is an attempt to furnish a logical explanation of two experiments on the velocity of light, the results of which at first seem contradictory. We have not time to consider these experiments, but one of them was by Fizeau, in 1851, which seemed to show that the properties of the ether through which light passes are in no way affected by the motion of a gas present—*i. e.*, the ether stays at rest. If this be so, the velocity of light should be different, depending on the direction of the observer with reference to the light source. Michelson and Morley tried this test with the greatest care, using methods sure to detect a difference if it existed. None was found. In other words, the ether has been proved

to be at rest relatively to moving matter, and Michelson assumed that this showed that the ether is fixed to the earth, and the relativists are inclined to conclude from this that no such medium as the ether really exists and that we are just as ignorant of the mechanism of the transmission of radiation as we are of that of gravitation. On the other hand, it has been proposed by Fitzgerald and Lorentz that all bodies in motion are thereby shortened in the direction of motion by just the proper ratio to account for the negative result of Michelson's experiment. This startling theory has gained a great weight. So physics along these lines may be on the verge of another revolution, though most of us may for the present retain without special embarrassment our mental conception of an elastic ether and its electromagnetic waves.

The objectivity of matter, I presume, is apparent to all of us, Tait calling attention to the fact that it is often offered "for sale" or "for let," and, of course, anything that can be bought or hired must have an objective existence. But surely accepting such an argument would imply far too much now in America. Indeed, the same author admits later that "to have its price" is not conclusive of objectivity, citing as evidence that titles, family secrets and even college degrees are sometimes sold.

On first thought it would seem far easier to study matter than to study energy, and this is so, perhaps, if one does not proceed farther than to analyze and to classify the properties of the bodies having tangible and visible size. We can, for example, find out nearly all there is to know about a certain piece of glass, considered only as a mass of glass of definite size and shape. We can measure its mass correct to one part in ten million; its linear dimensions correct to one hundred thousandth of a centimeter; its density, elasticity, refractive index, dispersive power, etc., are known to a high degree of accuracy. Suppose now we have made a similar physical examination of a definite piece of quartz. At once is suggested, why this difference in properties? They must be due to the

differences in the finer structure of the substance not apparent by the grosser methods of examination. Chemistry now steps in with its beautiful analytic methods and classifies the many substances or kinds of matter composing bodies.

At any particular time in the history of science a chemist would have told us that all substances are either elementary or compound, the number of the former class being definite, say seventy-five, while the number of compounds is far greater and less definite. At almost any subsequent date the number of elements would be stated as larger, this increase from time to time resulting in the dividing of a supposed element into two, or, from the discovery of new ones, all the former ones remaining intact. The separation of didymium a few years ago into its neo- and praseo-constituents is an example of the former method, while the latter has been exemplified more recently by the discovery of several unsuspected constituents of the atmosphere. I refer to the inert gases of the argon group.

In contemplating the finer structure of any body of matter —*e. g.*, a crystal of rock-salt or a piece of some familiar metal such as lead—we meet two avenues of thought. We know by trial that we can divide and subdivide each piece till we reach the limit of microscopic vision, but can this be done indefinitely? It seems obvious that there is no limit to the subdivision of a geometrical length, but is the same true of a material object? The notion that it is not, originated centuries ago in the minds of Leukippos and Demokritos, to whom we owe the conception of the word "atom," the uncutable particle from which all matter is built up. The atomic theory of matter gained little attention down to the time of Newton, and then again rested for a century, until the famous English chemist, Dalton, founded the modern atomic theory of matter which, in its growth and development to the present time, has successfully met every demand made upon it by modern science.

Until rather recent years physics was said to treat of masses

and molecules and their energy relations, while chemistry investigated molecules and atoms and their energy relations. More recently, physics and chemistry together, aided by that ever-powerful ally, mathematics, have strenuously attacked the atom, hoping through this doorway—narrow, it is true, but manifold—to flash now and then a ray of light illuminating for a moment, if but dimly, the mysteries beyond.

I have used the terms molecule and atom. Let us note clearly what these signify. The former, which from its derivation means "a little mass," is defined as the smallest portion of any particular substance or kind of matter which can exhibit the properties of that substance. For example, the smallest particle of common salt that is salt is the molecule; if by any means, as in chemistry, we subdivide the molecule, we get atoms, alike or different, and these present properties entirely different from those of the molecule. In the case cited, a molecule of salt is built up of an atom of the metal sodium and an atom of the gas chlorine—two substances quite unlike and entirely different from salt. These are called elements, and an atom of the gas chlorine—two substances quite unlike and entirely different from salt. These are called elements, and substances formed from different elements are called compounds.

Suppose we consider for a moment the size of these atoms and molecules of which we so confidently speak. Chemistry furnishes us with indisputable evidence as to their relative sizes; we know that an oxygen atom is about sixteen times as massive as one of hydrogen, which is the smallest known; but what about actual size? I cannot give you the methods of attacking this problem; many there are, but I can briefly state the results.

In describing magnitudes of quite different orders we are forced to adopt appropriate units for expression that the mind may, in a measure at least, be able to appreciate the different magnitudes expressed. The mention of a mile calls to one's mind a rather definite length which it appreciates, so when

one is told that two places are twenty-five miles apart we know about what that means. If, however, this distance were expressed in feet or in inches, no one would have any idea of the magnitude expressed, because of the inappropriateness of the small unit to express so large a distance. Again, we receive very definite information when told that two stakes are placed ten feet apart, while if this distance were expressed in miles we should again be hopelessly confused.

Now a molecule is so small as to require an exceedingly small unit to express its size. Microscopes, with their micrometer eyepieces, can measure distances smaller than a one-hundred-thousandth part of an inch, or about one-half the wave length of yellow light. But this distance is one thousand times greater than the probable diameter of a hydrogen atom. A better idea is gained in this way than if I had said at first that the diameter of a hydrogen atom is about a hundred-millionth of an inch. Again, as you all know nearly all scientific measurements are made in the metric system, in which a meter (about forty inches) is the starting point. A thousandth of this is a millimeter (about 1/25th inch), and a thousandth of this is called a micron, and 4,000 hydrogen atoms laid side by side would reach about this distance. Further, it is estimated that the number of atoms in a single drop of water would be expressed by a number far beyond one's mental power to appreciate a number requiring twenty-two or more figures to write.

Again, the kinetic theory of matter now universally accepted teaches us that these atoms and molecules are in a state of ceaseless motion, the energy of which constitutes heat. The conditions are simplest and best understood in the case of a gas such as the air. If we imagine air magnified about a thousand million times, to use an illustration of Millikan's—*i. e.*, to make a pea grow to the size of the earth—a molecule would be about as large as a football, and if we could get an instantaneous snap-view of the situation, the scattered state of these bodies would be represented by one football in each

ten-foot cube. Furthermore, the state of motion would be such that, on the average, each would travel about 300 feet before hitting a fellow. Furthermore, in the case of hydrogen, the molecular speeds are of the order of magnitude of a mile a second.

The advances in physical science during the last century have been many and rapid, yet made with such care, each new discovery or generalization being criticized so severely and impartially that what had stood all tests and finally been generally accepted forms a most stable and reliant structure, to which, very recently, the trial framework of another story has been erected.

From the various experiments described by Crookes in 1879, he was led to believe that the residual gas in a very highly exhausted glass bulb, when subjected to the action of an electric discharge from an ordinary induction coil, presents properties so different from those of ordinary gas as to warrant the use of the term "radiant matter" to what we now call the cathode rays, and a more appropriate term cannot be conceived of in view of later researches. Crookes himself believed these to consist of streams of negatively electrified molecules, projected with high speed from the cathode or negative terminal, and he constructed a number of ingenious mechanical devices in support of this view. Although Crookes' conclusions were not then accepted by all, later developments have shown them to be in the main correct, except as to the size of the particles concerned. They have been proved to be far smaller than anything previously dreamed of. In fact, the world of atoms and molecules is a veritable macrocosm when compared with the microcosm of electrons which we are about to consider; for this is the term applied to the smallest body known to science.

It had been shown by Crookes that the cathode stream is easily deviated, both by a magnetic field and by an electrical one, and so, by an ingenious though simple line of reasoning, based upon well-known principles of dynamics, J. J. Thomson,

in 1897, was able to determine the speed, the mass and the electric charge of these little bodies. It was found further that the results were quite independent of the residual gas in the tube and also of the materials of the electrodes. As we proceed, this will be seen to be very significant.

The reasoning and the mathematics, though simple, would be out of place in an address of this character, and I must ask you to accept the results. In Thomson's experiments the values obtained for v, the speed of the particles was between 2.2 and 3.6 times 10^9 cm. per second, or about one-tenth that of light, the latter being 3×10^{10} cm. per second.

The value of e/m or of the ratio of the electric charge to the mass of its carrier was found to be between 1.5 and 2.0×10^7, each being measured in c.g.s. units. It was further found that this value also is quite independent of the kind of gas filling the tube before exhaustion, and also of the conclusion that these little carriers, or "corpuscles" as Thomson then called them, must be quite a strange form of matter and not at all identical with either a molecule or an atom, though perhaps forming a part, always the same in character, of atoms of all kinds.

Now it has further been shown by experiment that the value of e, or the charge conveyed by each carrier, is the same as that carried by a hydrogen atom in liquid electrolysis, and therefore, since 10^{-4} of a gram of hydrogen carries a unit charge, it follows that each corpuscle must have a mass equal to from one-fifteen-hundredth to one-two-thousandth of that of a hydrogen atom. In other words, the very atom of the chemist and of the physicist, conceived of more than two thousand years ago by Democritus, and glorified, as Tait puts it, in that grand poem of Lucretius; of the chemist as the smallest portion of matter capable of forming part of a compound substance, of the physicist as the smallest part that can receive or give an impulse or take part in an energy change, has been shown in the last few years to be about 1,800 times more massive than

the little body under discussion, and this, even though we choose the least atom known, that of hydrogen.

In 1895 Röntgen discovered some very wonderful radiant effects from a Crookes tube, called by him the X-rays, the properties of which have been studied ever since all over the world, and which have become of vital importance in several departments of science. They differ from cathode rays in not being deviable by either a magnetic or by an electrical field. They are unlike light rays in not being susceptible either of reflection, refraction, or polarization within the usual meaning of these terms.

The X-rays have been shown to emanate from the point where the cathode stream of corpuscles, or electrons as we will now call them, impinges on ordinary matter. Dense matter like platinum or tungsten has been found best for the purpose. Just as a magnetic field of force is produced around a wire conveying an electric current, so a moving electron has associated with it such a field of magnetic force. Now when the current is steady in the wire no effect results because of the field, but if the current be stopped, started or changed in intensity at once there starts from the conductor a disturbance in the ether as a result of a change in the magnetic flux. Also when an electron is moving uniformly nothing happens, but if it be suddenly stopped or started an intense pulse or jar is given to the ether and this is thought to constitute a single X-ray; its wave length is very short and in a single ray there are one or two or certainly only a very few waves. The X-rays from a Crookes tube are due to the stopping of the particles as they impinge on the platinum or tungsten target. We shall see later that similar rays may be produced by the starting or perhaps suddenly changing the direction of an electron's motion.

About a year after the Röntgen rays were discovered other rays having some properties in common with them and also with the cathode rays were discovered by Becquerel to be given off by uranium and its compounds. The results of the

study of these rays have led to the development of a new subject in physics,—radio-activity. A radio-active substance like uranium or thorium and their compounds is one giving off rays material or other kinds capable of ionizing the air, *i. e.*, making it a conductor of electricity.

Suppose we have a gas between two metal plates attached each to a terminal of some electric generator so that one plate is, as we call it, electrified positively and the other negatively. Ordinarily a state of equilibrium is maintained, as the gas is a first-rate insulator and no current passes between the plates. If, however, a uranium or thorium compound be placed between the plates, the gas at once becomes partially conducting, *i. e.*, it is said to become ionized—and a small current begins to flow, which can be measured by suitable devices. It is this ability to ionize a gas that makes it possible to study radio-activity. Except at very low pressures it is thought that an ion consists of a charged nucleus surrounded by an attached group of atoms. At very low pressure the negative ion is identical with a particle in the cathode stream of a Crookes tube. Conduction in the gas thus consists of the carrying of the negative charges by the ions to the positive plate and of the positive charges to the negative plate, thus tending to equalize the potentials. We have here then true electric convection.

In 1898 Mme. Curie, having taken up the study of the various salts of uranium and then of the various minerals containing uranium, announced through Professor Becquerel her results. Her first important conclusions were that the salts were active in proportion to the uranium in them, but that the minerals were not so. For example, uraninite, or pitchblende, as it is called, was found to be several times as active as metallic uranium itself, hence uranium cannot be the chief agent in the production of the effects in the case of the ore.

After a long and most careful chemical research, Mme. Curie and her husband separated from a very large amount of

uraninite a very small quantity of an active substance similar to bismuth which seemed to be a new element. They called this polonium, from Poland, their native country.

Continuing their work with vigor, the Curies soon announced the separation of still another elementary substance from uraninite closely allied to barium with a radio-activity many thousand times that of metallic uranium. This they called radium. The great popular as well as scientific interest in this wonderful substance would justify the time necessary to relate some of its properties, even if it did not furnish a very suitable example for illustrating the latest theory of the relation between electricity and matter, to be spoken of presently. The quantity of radium obtainable from uraninite, so far the most fruitful source, is exceedingly small. It is estimated that to obtain a few ounces would require the working up of thousands of tons of the mineral.

A third radio-active substance, which is allied to iron, was discovered by Debierne in 1899; this is called actinium. These events opened up an entirely new department of science, and the superb work of the Curies, J. J. Thomson, Rutherford, Kaufmann, as well as that of Boltwood and of Millikan in our own country, and many others probably whose names should with equal justice be mentioned, has resulted in much new science and in throwing some light on the mysterious problems yet to be solved.

Without going into the details of the methods of investigation, let me say briefly that it has been found that radium, for example, sends out so-called "rays" of three kinds. Rutherford designated them, first the α-rays, which were found to be positively electrified particles penetrating ordinary matter but feebly, only very slightly deviable in the strongest force fields, and having a mass of the same order of magnitude as that of hydrogen atoms; second, the β-rays, identical with the Crookes or cathode rays, *i. e.*, negatively charged particles, very penetrating, easily deflected by both a magnetic field and an electrical one, called at first "corpuscles," but later identified

with electrons or the ultimate building material of atoms; and, lastly, γ-rays, probably identical with the Rōntgen rays, very penetrating and non-deviable.

The γ-rays in radio-activity are thought to be produced by the enormous acceleration resulting from the expulsion of electrons from atoms of the radio-active substance. A detailed study of radio-active phenomena shows with little doubt that the process is absolutely unaffected by any physical or chemical treatment. It would, however, be foolish to predict with assurance that this will always be so. The activity is unchanged in passing from the temperature of liquid air to that of red heat. The activity of a uranium compound is in direct proportion to the amount of uranium present, and is in no way dependent on the other substances in chemical composition. It would seem, therefore, that the changes going on are associated only with the atom of the active substance and not at all with the molecule of which that atom is a part. Since, too, it is only a substance of the greatest atomic mass, as for example uranium and thorium, which is radio-active, it is clear that the expulsion of a few α-particles would be quite possible without changing very much the total mass of the atom. For example, uranium changes its atom by the expulsion of two α-particles to a new and different atom discovered by Boltwood and named by him ionium, while ionium changes to radium by the loss of another α-particle. The proportion of the total atoms present at any time which expel α-particles each second differs with the different substances. For instance, the substance into which radium changes is a radio-active gas first known as radium emanation and later called niton. Of this substance about two-millionths of the total number of atoms present at any time change per second. The result of this is that a given amount of niton is half changed in about 3.75 days. This is a rather rapid change, radium being reduced to half value in about two thousand years and uranium in 4.6×10^9 years. The view that the atoms of the radio-elements are undergoing spontaneous disintegration was put forward by

Rutherford and Soddy as a result of evidence of the character cited above. On this view it seems probable that the ejected α- and β-particles are not set suddenly in motion, but that they escape from an atomic system in which they were already in rapid oscillatory or orbital motion. The energy is then not communicated to the projected particles, but exists beforehand in the atoms from which they escape.

Thus we see that after a long series of transformations, each of the elements, uranium, thorium and actinium, gives rise to matter which is either entirely inactive or possesses such a feeble radio-activity that it cannot be detected by the sensitive methods at our disposal. If these final products of the transformation are stable, they must accumulate in quantity in the radio-active minerals and after the lapse of geological ages should be present in sufficient quantity to detect by ordinary chemical methods. Since the final products of the transformations are believed to be solids, the amount of them in an unaltered mineral should depend on the amount of the parent element originally present and on the age of the mineral.

Let us first consider the question of the end product of the uranium-radium series. It has been shown that the disintegration of uranium results in the expulsion of eight atoms of helium. Since the atomic weight of helium is 3.994 and of uranium 238.5, the atomic weight of the end product should be 238.5—8 x 3.994 or 206.6. This is very near to the accepted value of the atomic weight of lead, viz., 207. In this calculation, the loss of mass is supposed to be inappreciable in a product which does not emit α-rays.

The suggestion that lead was the end product of the uranium series was first made by Boltwood, and has been supported by him from consideration of the relative amounts of lead and helium in old unaltered uranium minerals.

The evidence obtained from the examination of a large number of radio-active minerals undoubtedly affords very strong support for the view that uranium is ultimately transformed

into lead. On this assumption, it is a simple matter to calculate approximately the age of the radio-active mineral from the amount of lead present. This will give a maximum estimate of the age, for there is always a possibility that a part of the lead was deposited during the formation of the mineral. On the other hand, the age determined from the helium content gives a minimum estimate, for in practically all cases a part of the helium formed must have escaped.

The following table compiled by Holmes gives the ratio Pb/U found for a number of radio-active minerals, of which the probable geological period is added. The age in millions of years has been deduced on the assumption that all the lead

Geographical Period.	Pb/U	Age in Millions of Years.
Carboniferous	0.041	340
Devonian	0.045	370
Pre-carboniferous	0.050	410
Silurian or Ordovician	0.053	430
Pre-Cambrian:		
(*a*) Sweden	0.125	1025
	0.155	1270
(*b*) United States	0.160	1310
	0.175	1435
(*c*) Ceylon	0.200	1640

observed is derived from the transformation of uranium, and, therefore is a maximum value. We are thus brought face to face with a theory of inorganic evolution as a suitable complement in nature to that of organic evolution of which we've heard so much. That all mineral substances are gradually undergoing spontaneous change from a more to a less complicated atomic structure by the expulsion of helium atoms and atoms of negative electricity is not at all improbable. We have not discovered this process in more than a very few cases because of the exceeding sensitiveness required of the instruments employed. Gas ionization is the effect observed, but this required a certain speed of ejection of the α- and β-particles and this necessary minimum may not be attained except in a

few substances though a smaller speed may exist in many cases. Only the analysis of similar specimens of various ores over geologic periods can perhaps settle this question. It is, however, a significant fact that pitchblende or the oldest uranium ore contains traces of almost all of the metals.

That electricity is atomic in character, *i. e.*, is composed of like units, all charges being simple multiples of this, has been long thought possible, even probable. Faraday, many years ago, showed conclusively that the amounts of electricity carried by atoms is always either equal to or is an exact multiple of a single charge, viz., that carried by the hydrogen atom, and the term electron had been proposed as the name for an atom of electricity.

Subsequent to the work of Thomson on the cathode particles it was shown that little bodies having properties identical with those of the cathode particles are emitted from metals under the action of ultra violet light and also self-luminous solids. All these coincidences gradually suggested the thought that the electrical part of the corpuscles of Thomson might really be the whole thing, that is, that their mass inertia might be electrical in nature and further that all mass might be electrical.

We have spoken of the β-particles as the electrons, but what about the α-particles? It was early shown that these are identical from whatever source derived, and, further, helium is always associated with the minerals containing radio-active substances. This suggests that it has some necessary connection with radio-active processes. Helium has a peculiarly interesting scientific history. It will be recalled that in the early study of the spectrum of the sun a prominent line in the yellow, close to the sodium lines, was noticed by Lockyer, which could not be identified as caused by any substance known then on the earth. The substance in the sun giving rise to this line was appropriately named helium. More recently, in 1895, Ramsay discovered helium occluded in certain minerals, notably cleveite, which were soon found to be

radio-active. A little later Ramsay and Soddy obtained the helium spectrum from the gas emitted from a few milligrams of pure radium bromide dissolved in water. The crucial test, proving beyond a reasonable doubt that α-particles without their positive charges constitute the helium atoms, was made by Rutherford by direct experiment, and Rutherford and Boltwood have made the latest and the most complete series of experiments for the direct determination of the amount of helium produced from a given quantity of radium under given conditions. Helium is further noted in being the most difficult and hence the last gas to be liquefied. This difficult feat was at last accomplished by Onnes, of Leyden. At atmospheric pressure helium liquefies at 4.26° absolute; its critical temperature is 5.25° absolute and its critical pressure is 2.26 atmospheres. When boiled at reduced pressure a temperature of about 1.5° absolute results, the lowest yet obtained.

Let us now return to the β-particles which have been shown to be identical with the cathode rays in a Crookes tube, except that when emitted from radio-atoms their speed is much greater, sometimes reaching nine-tenths that of light. Since an electrically charged body exerts force all around itself, it can be shown from theoretical considerations that to start or stop or to accelerate such a mass requires a greater force than when not charged; this means that the body's inertia, or effective mass, is greater when charged. This is clearly due to the effect of the magnetic field always present when electricity is in motion. This increase in effective mass due to the charge is negligible for ordinary speeds and for bodies even as small as an atom, but not so for electrons approaching the speed of light as some of the β-particles do in the case of radio-activity.

In the case of an electron having a velocity of the same order of magnitude as that of light, a further analysis is necessary. In this case the electrical mass can be shown theoretically to depend on the speed. A contemplation of Doeppler's principle will make this evident, since, as the

charge changes position, there is a continuous though not instantaneous readjustment of the lines of force, which would radiate in all directions in straight paths if the charge were at rest. When the speed of the charged sphere has reached that of ether wave-motion the force tubes would all be equatorial and the inertia infinite.

If, then, it could be shown experimentally that the effective mass of a moving charged body is dependent on its speed, a part at least of this mass would have to be electrical. The experimental test of the question was made by Kaufmann when he measured the ratio $\left(\frac{e}{m}\right)$ in the case of the fast moving β-rays from radium. These rays have a higher average speed than cathode rays, and in Kaufmann's experiments rays of different speed were measured. The ratio $\left(\frac{e}{m}\right)$ varied from (1.31 to 0.63) x 10^7, according to the speed of the particles.

Referring to Kaufmann's experimental results, attention is directed to the following table:

I	II	III	IV
v	$\left(\frac{e}{m}\right)$	$\frac{m}{m_o}$ (Exp.)	$\frac{m}{m_o}$ (theory)
2.36 x 10^{10}	1.31 x 10^7	1.50	1.65
2.48 x "	1.17 x "	1.66	1.83
2.59 x "	0.97 x "	2.00	2.04
2.72 x "	0.77 x "	2.42	2.43
2.83 x "	0.63 x "	3.10	3.09

Column I gives five speed values actually measured of β-rays from radium. Column II gives the corresponding $\left(\frac{e}{m}\right)$ for each experiment. Column III gives the five respective values calculated from the results of experiment, of the ratio of the mass of radium β-particles to that of slow-moving electrons. For these latter particles $\left(\frac{e}{m_o}\right) = 1.95 \times 10^7$, the speed being comparatively slow, the charges being, of course, the same. In column IV are found the ratios of the same masses calculated from the theoretical formula by substituting the different

values of v given in column I. Attention is called to the very close agreement between columns III and IV, and also to the very weighty evidence thereby offered that the total mass of a moving corpuscle is electrical. It is surely worthy of note, too, that the agreement is closer for the higher speeds, which further strengthens one's belief in the theory that all the mass of an electron is electrical.

During the last year or two Professor Millikan, of the University of Chicago, has made some very remarkable experiments tending to prove beyond possible question not only the truth of the kinetic theory of matter but the atomic nature of electricity. A further purpose of Millikan's work was to determine the most probable value of the electron, or one atom of negative electricity, in c.g.s. electrostatic units. He was able by observing the motions of electrified microscopic oil drops balanced against gravity in an electrical field, variable at will, to calculate the value of the electron to a high degree of accuracy. This value is said to be $(4.774 \pm 0.009) \times 10^{-10}$.

In the preceding discussion it has been assumed that electricity is only of one kind, this being the kind conventionally called negative. On this hypothesis an uncharged neutral molecule becomes negatively charged by the acquisition of an extra electron, and positively charged by the loss of one.

It will be remembered that the old two-fluid theory of electricity assumed three entities, positive electricity, negative electricity, and matter—uncharged matter having combined within it equal quantities of positive and negative electricity.

The one-fluid theory of Franklin assumed the existence of two entities, matter and positive electricity, the former in a neutral state, having combined with it a certain normal quantity of the latter. A positively charged body was then one having more electricity than normal, and a negatively charged one had less.

The present theory assumes only one entity, the kind of electricity formerly called negative, atoms of matter being

made up of different numbers and arrangements of these smaller atoms of negative electricity or electrons.

The following crude illustration may help to make this idea conceivable: For example, a whole city (a molecule) or group of cities (a mass) might be composed of separate buildings (the atoms), either all alike (an element) or of many shapes and sizes (a compound), while every building might be made of bricks (the electrons) exactly alike in every respect. This notion that all matter in its simplest state is of only a single kind is, of course, not new, though the very forcible experimental evidence indicating such a state of affairs and that this ultimate unit of structural material is the atom of negative electricity has been offered within a comparatively short time.

But what of positive electricity and its atom? Are we justified in ignoring that altogether? Certainly not in view of the work of Thomson and of Rutherford. Both of these scientists believe in positive electricty though they do not agree as to its relation to electrons and have not been able to identify its atom. According to Thomson an atom may consist of a large number of electrons immersed in a mass of jelly-like binding material which attracts the electrons while they themselves are mutually repellent.

On the other hand, Rutherford is inclined to think of the atom as composed of a very small concentrated nucleus of positive electricity, outside and around which the electrons circulate—perhaps as the planets move in orbits about the sun.

It is not likely that general agreement will result in the very near future, but science along these lines is gradually approaching a unity of mind in many details.

While it may be urged in conclusion that definite steps have indeed been taken, but only deeper into the mystery, yet assuming the truth of the electron theory as here briefly set forth, we find ourselves now face to face with a single problem instead of many, the solution of which would open wide the door to a comprehensive knowledge of many things now unknown and formerly unknowable.

THE MONASTERIES OF METEORA

By Walter Woodburn Hyde

Assistant Professor of Greek, University of Pennsylvania

In opening this series of public lectures last November, Professor Cheyney, in his talk on Queen Elizabeth, apologized for choosing a subject so far removed from present-day life and thought as the details of the court of an English queen of 300 years ago. He plead in excuse the insatiable curiosity of mankind, which impels us to know everything that can be known. In presenting this, the last lecture of the course, I need offer no other excuse for taking you still further afield from the interests of today and giving you an actual glimpse into the Middle Ages, whose life and ways of thinking still linger on in certain remote and obscure places of the earth.

Perhaps this life can nowhere be studied better than in the monasteries of the Greek Orthodox Church. Therefore I invite your attention this afternoon to a short account of a visit which I recently made to the Cambunian Mountains, which still form the boundary between Greece and Macedonia. Here in the northwestern corner of Thessaly are situated on the tops of isolated pinnacles of rock, some of the most curious of religious establishments—the famous monasteries of Meteora.

The monasteries of the Eastern Church have always charmed lovers of the romantic by their remote and picturesque situations. To be sure such locations—solitary mountain tops or unfrequented islands—were largely chosen for the sake of security and solitude. But sometimes that same romantic sense which guided the old Greeks in their choice of temple sites amid the picturesque scenery of woodland, hill and sea, was displayed by the mediæval monks. A few examples taken at random will illustrate these motives. The ancient monastery of St. Catharine on Mt. Sinai looks far more like a rock

fortress than a retreat for holy fathers. Until recently its only means of ingress was an aperture high up in the stone wall, into which adventurous visitors were hoisted by a crane, like so many bales of hay. Curzon, in his delightful book on the "Monasteries of the Levant" describes a Coptic convent of the Virgin up the Nile, known as the "Convent of the Pulley." It is situated on a narrow ledge near the top of an almost perpendicular rock rising 200 feet over the river. At its base is a cave reached by a boat and from here a shaft-like chimney ascends straight through the rock for 120 feet to the beginning of a path skirting a narrow shelf to the convent above. Curzon humorously narrates his ascent in 1830, in the wake of the abbot, whose portly form quite filled the opening above him. The same author describes another at Sumelas, south of Trebizond in Asia Minor, which is a veritable eagle's nest clinging to the side of the cliff. The buildings of this monastery are crowded around the mouth of a cave in the rock a thousand feet above the plain and only accessible by a series of wooden stairs. Here and there tiny gardens peep out from terraces formed by the fissures of the cliff and are reached by rock-hewn steps. Another more curious still is a deserted abbey near Cæsarea in Cappadocia described by Tozer in his "Visit to Athos." This is a Byzantine Pompeii on a small scale; the cliff is hollowed out into chambers, the cells, tombs, even the benches and tables in the refectory being hewn from the living rock. Another, where I once spent the night, is Megaspelion, the largest monastery on the Greek mainland, situated in northern Arcadia below the Corinthian Gulf. Here the chief building fills the mouth of a great cave—whence the name μέγα σπήλαιον—the original home of the monks. But the grandest of all are the twenty or more convents on the sides of Mount Athos, the "Sacred Mount" of the Greeks, situated amid magnificent scenery formed by a combination of rock, forest and water, a scene without a parallel elsewhere. Here the abodes of the monks are placed on the tops of precipitous cliffs or at the mouths of deep glens in the sides of the

promontory, where they command glorious views over the island-studded Ægean. In order to get from one convent to another, you must descend one cliff to the sea-level and then, after being transported to the base of another, climb up again, for only the experienced have the temerity to follow the narrow footpaths around the folds of the mountain, along the brink of chasms a thousand feet or more in depth. Such picturesque sites as those of Jerusalem monastery high up the side of Parnassus beside a mountain torrent surrounded by venerable pines; or of Vourkano on a lofty ledge of Mt. Ithome in Messenia, partly hidden by a grove of maples and cypresses; or of Daphni amid the forests of Parnes near Athens—these all show the monks' love of romantic nature in their choice of spots for meditation and prayer. Yet among all these monastery sites, none is more curious or wonderful than the group of convents perched on the pinnacles of the rocks of Meteora.

While in Greece a few summers ago I visited these curious habitations of man. My companion and I took the railway from Volo—the port of Thessaly—to Larissa, which is still as in antiquity, the capital of the province. It lies about midway between Tempe and Meteora, the two great attractions of Thessaly, one of which is in the northeastern, the other in the northwestern corner of the country. Before proceeding to Meteora we made a carriage journey to the famous vale, thirty miles away. Since our visit a railway has been built from Larissa to Keralik-Derveni on the sea at the eastern base of Mt. Olympus near the entrance to the ancient province of Pieria, the cradle of European song. So now the crags and forests of Olympus and Ossa, whose bases form the giant walls of Tempe, resound with the shrieks of locomotive whistles, a realistic inroad into the fancy of lovers of the romantic, which we were mercifully spared.

On returning to Larissa, we took another carriage to Kalabaka, the little village near the monasteries. In order to avoid the great heat of a day in July, we made the sixty-mile drive in the night. It was late afternoon when we started over the

plains to the west, and we witnessed a glorious sunset on the opposite range of Pindus. Just at nightfall we crossed the Salamvria—the ancient Peneus—by a hand-propelled ferry, and soon were driving over the plain of Trikka so famed in antiquity for its breed of cavalry horses. It was hereabouts that those curious myths grew up concerning the Centaurs, at first a barbarous race of men, but later, through traditions of the equestrian prowess of the early Thessalians, metamorphosed in Greek fancy into the race of monsters so well known to us from Greek art.

Even yet horse-breeding is carried on here, though no genuine local strain any longer exists. At about three o'clock in the morning we reached Trikkalá, the site of the ancient city of Æsculapius. We had still fifteen miles to drive northward and it was well after sunrise when we reached Kalabaka. The sight of the country, green and smiling in its morning glory, was a recompense for the discomfort of the wretched vehicle and road. On either side were vineyards and fields of cotton and grain. Far away to the east, Olympus and Ossa, with the huge cleft of Tempe between, were in plain sight; close by on our left stretched the long wall of Mt. Pindus, its shadowy glens brightening under the first low rays of the sun; behind us was Trikkalá crowned by its castle, while before us loomed the gray cliffs overhanging the village of Kalabaka. Slowly we ascended the gentle slope at their base, which was covered with mulberry trees whose foliage contrasted strangely with the bare rock above, and finally we reached the village square.

Kalabaka is the ancient Æginium described by Pliny as nearly impregnable, and so today it seems. Behind the town enclosing it on two sides are the perpendicular rocks which we had long been approaching, divided by a deep and almost vertical cleft. This cleft, through which winds the path to the hamlet of Kastraki and the monastery rocks, is the only part of the cliff side of the town which had to be fortified. In front of these natural walls the village opens out over the plain, the lower parts being defended in antiquity by walls of masonry.

Near Kalabaka the Pindus and Cambunians come together at right angles, leaving only a narrow valley between, through which the Peneus reaches the plain of Thessaly. So the town commands the approaches into Greece from Macedonia and Epirus, guarding this corner of the country as Tempe does the other. During the Roman wars Æginium was of great strategic importance. In the late Middle Ages, however, it changed its warlike character for one of peace, and became famous for the many monasteries founded in its vicinity. In fact its Byzantine Greek name, Stagoús, now superseded by the Turkish name Kalabaka, is merely a corruption of the Greek words εἰς τοὺς ἁγίους, meaning "to the holy ones." Apart from its religious associations and its lovely view over Thessaly, the town has little to interest the traveler.

After the usual Greek breakfast of black coffee, olives and bread, we procure horses and begin the circuit of the convents. We slowly wend our way upwards through the mighty cleft, the rocks rising five or six hundred feet above us, and follow a tortuous path, which in places is little else than a series of rock-hewn steps. After a half-hour's climb we reach Kastraki, grandly situated in an amphitheater of hills behind the rocky wall which forms the background of Kalabaka. This canyon village is hemmed in on three sides by cliffs, on the tops of some of which we get glimpses of the monasteries, so that in winter its upper part never sees the sun. Only the fourth side is open, the fissure through which we had come, whose walls frame the plain of Thessaly far below; a lovely aquarelle in which nature has lavished all her colors: the "silver-gleaming" Salamvria with its great curves beautifully harmonizing with the green meadows; the white and pink houses of Trikkalá in the middle foreground and the heights of Pharsalus beyond, while the dark outline of Othrys closes the view; over all the deep blue sky—such a picture as nature only paints in Greece or Italy. The path winds higher through a grove of mulberries and a labyrinth of rocks. At last we reach a great natural platform in the midst of the cliffs on whose tops the convents stand.

These cliffs rise all around us like giant sentinels. Some are in groups, others isolated like obelisks and cones, separated by deep chasms. They seem to have been broken away from the main chain of the Cambunians by some primeval catastrophe, which has left this cluster of twenty-five or more rocks rising straight in the air. At their bases and in the recesses between them is a thick growth of trees and shrubs out of which they rise naked and gray. Some are rectangular with level spaces on top; others, like the needle rocks of Chamouni, look like giant tusks and have only room above for a tiny chapel; while still others, slender and straight, resemble the columned ruins of some prehistoric temple. It is a desolate and solemn spot, where the stillness is only broken by the twittering of birds or the tolling of the convent bells; a place only fitted to "lodge such as hold the body foe to soul."

These austere retreats

Of the monastic brotherhood on rock aerial

were built for the sake of security during the troubled times from the fourteenth to the sixteenth centuries. The Saracens seem to have conceived a great fancy for hermit baiting, if we may judge from the subjects of early Greek ecclesiastical paintings with their stiff figures on backgrounds of gold, in which Moslem knights are slaughtering with long spears helpless monks, whose emaciated bodies are clothed in coarse matting. Greek hermits and Greek saints are always portrayed as ugly and as dirty as the artist can make them, for in the Greek church, the older Hellenic rule of "goodness and fairness" has never been in favor, but there has always been an intimate relation between saintliness and dirt. Besides the story which such pictures tell, the inaccessible locations of so many Greek monasteries show how the monks throughout the East were once looked upon as the lawful prey of anyone who wanted to hunt them down. But it was not always the Mohammedans who molested them. They were constantly raided by bands of Greek robbers, the so-called Klephts, the men who refused to

yield to Turkish rule and took to the hills where they kept the fires of liberty alive. For sustenance these romantic thieves depended quite as much on their fellow Christians as on the infidels. That such persecutions continued at Meteora even down to the middle of the last century, is attested by the story which Tozer, during his visit to the monasteries in 1853, heard from the monks of the convent called Meteoron. They said that their abode had been pillaged a few years before by the Klephts, though they did not explain how the ascent was effected. Tozer, while taking his supper at St. Stephen's, heard the shouts of men outside, and on inquiry learned that a band of robbers was demanding provisions. The abbot bade him go on with his meal in peace, for he said this was no unusual occurrence and besides the drawbridge was up!

The first monastery in this vicinity was one erected to the Panaghia (Virgin) in the fourteenth century. Its ruins are still visible on the rock overlooking Kalabaka. Long before that date many holy men, who had withdrawn from the conflict of life, had come here and like rabbits had burrowed holes in the fissures of the rocks. The Saracens made it so unpleasant for these poor anchorites that they were finally compelled to band together and seek habitations more secure, and so the first monastery was built. In the course of time twenty-three more followed. Most of these proved short lived, fully one-half disappearing by the sixteenth century, and the number has gone on diminishing until now there are only five still inhabited. These are called Meteoron or Metamorphosis, St. Barlaam's, St. Stephen's, The Holy Trinity and St. Nicholas'—the latter having but one monk at the time of my visit. We saw plainly the ruins of many others, which are now the undisturbed haunts of birds. Those that are left show unmistakable signs of decay and poverty. But few novices are taken now and it will not be long before they will be deserted. In fact, there is talk of turning them over to the state so soon as the present generation of monks has passed away, when they will be used for prisons.

As you look up at these eyries peeping down from the tops

of the cliffs, you wonder how the materials to build them could ever have been lifted to such heights. But you are far more concerned with the question how are you going to reach the top of one for a short visit? For there is neither door at which to knock nor bell to ring; the only way to make your presence known is to shout at the top of your voice, and await developments. In Klephtic days the firing of a gun served this purpose. You sit patiently down on a rock and wait, painfully aware that you are being inspected from above by some long-bearded father who is complete master of the situation. If he is satisfied with your appearance, you will soon hear a voice from the sky and soon you will see one of the brothers leaning out from his aerial tower and waving permission to ascend. You then have a choice of two modes of entry—either by a series of wooden ladders strung along the perpendicular cliff, where you take your life in your own hands, or you may be hauled up by a rope and net like a bag of provisions. There is but little real choice between the two modes; in any case, in the absence of flying machines or wings, there is no other way of approach. The ladders are absolutely vertical and are attached more or less securely to the face of the rock by means of wooden pegs, and are constructed in sections, so that at times it may be necessary to step in midair from one to another across a tiny ledge. The series extends upwards generally to the mouths of tunnels which connect with the lower buildings of the convents. Part way up there is sure to be a break in the chain of ladders; the end of one will swing free on hinges, so that it may be drawn up by the brothers at nightfall or in times of danger, rendering the convent completely isolated from the rest of the world; then it is literally in "midair," as the name "Meteora" indicates.

We first attempted the ascent of the Monastery of the Transfiguration (Metamorphosis) usually called Meteoron, which is the largest and most interesting of the Meteora group. The monks refused to lower a net, but invited us to come up by the ladders. It is about 150 feet to the projecting tower, and a large part of this distance must be mounted by ladders, until

the mouth of an inclined tunnel is reached. Following the old Greek custom, we proceeded to draw lots as to who should ascend first. The lot of my friend "leaped forth," so I seated myself comfortably on the rock to watch him climb. He soon reached the free end of the swinging section of the ladder; it began to wobble with his weight and rattle against the rock. In spite of the encouraging shouts of the monks above and my own persuasive words, he paused, looked down for one fatal moment and then with all speed began to descend. The undertaking looked so easy from below that I felt like ridiculing him. He quietly bade me try it myself. Bravely I started up, but was soon mortified at not being able to mount even as high as he had; for when I tried to climb over on to the free section of the ladder, perhaps sixty feet in the air, it vibrated to such an extent that I had to own myself defeated, and when I found some of the rungs were loose and turned in my hands and that the whole rickety affair seemed none the better for wear, I only bethought me of descending as fast as I could. Two disappointed brothers were gesticulating above; it doubtless seemed easy enough to them, but all their powers of persuasion could not induce either of us to make the experiment again. Nor would I recommend any such mode of ascent to any but sailors and steeplejacks.

Disappointed and crestfallen, we went on to the neighboring convent of St. Barlaam's. Here the windlass seemed in good order, for after shouting below, we soon saw a rope with a net and blanket tied to its end slowly let down by a pulley fastened to a beam which projected from the top of the tower. When the bundle finally reached the ground, our horseboy unfastened it and spread out the net and blanket on the rock for me to sit upon. Then he brought the ends of the net together over my head and caught them over a heavy iron hook dangling at the rope's end. At length all was ready and I felt myself gently lifted from the ground. The sensation of being hauled through the air is almost indescribable. Because of your weight the net draws tight around you, forcing your knees up to your chin

and for four awful minutes you ascend revolving in the air like a ball. If you want to avoid a bad case of sea-sickness—and you could find no more inconvenient place for such an ordeal—you must keep your eyes tightly closed. You cling convulsively to the strands of the net with both hands; now and again you take courage to peep down between your legs and view the whirling rocks and trees as they slowly recede; at times your knees graze against the cliff and you feel like grasping at any blade of grass you may pass. All the time you are harassed with doubts as to the soundness of the rope and net or the stability of the machine above. You anxiously wonder if there has ever been a mishap. But as you mount higher, the rope becomes shorter, and your movements become steadier. In this unceremonious fashion I was pulled through the air for some 240 feet, until finally I arrived at the level of the tower, where a couple of brothers gently fished me in with a hooked pole and landed me on the floor, a confused and helpless mass, with little idea of the cardinal points and less of zenith or nadir. They then proceeded to disentangle me from my humiliating position. So soon as I could stand, I was most courteously welcomed by the hegumen or abbot, a mild looking old man with snow white beard, and answered his greeting as well as my broken complacency and Greek would allow. My initial embarrassment soon left me, as I saw that none of the monks regarded my peculiar advent as any other than an ordinary one.

While waiting for my companion to go through the same ordeal, I examined the room into which I had thus arrived from the sky. I examined with interest the big horizontal windlass—several feet in diameter—around which the rope was coiled. My misgivings were but little allayed when I surveyed the emaciated looking men who had furnished the power for this gigantic wheel. But I was comforted to learn that no accident had ever been recorded, although for centuries hundreds had been drawn up out of the depths by these holy fishers of men. "They cast their net"—to use the words of Canon Wordsworth

—"into the world below; sometimes they enclose and draw up in it an inquisitive traveler; sometimes a brother Coenobite from Mt. Athos, sometimes a neophyte yearning for solitude and religious meditation; once they received in this manner an emperor, who came here, it is said, to exchange the purple of a Constantine for the cowl of St. Basil."

As soon as my friend had joined me from the sky we were shown what courtesies the convent could offer. A young monk of agreeable appearance and manners was delegated to be our guide. He was dressed like an ordinary Greek priest in a long flowing black gown and wore a rimless cylindrical hat with projecting flat top; and of course his hair and beard were long. But I soon found he was far above the ordinary parish priest in intelligence. It was a pleasure to see with what animation he spoke of the great days of old Greece. Like every educated Hellene he knew his Homer, and seemed very proud to recite several of the adventures of "poleeméhkanos Otheesefs," as he pronounced in Romaic the name of the hero of the Odyssey. The renown of Leonidas and Miltiades was also well known to him. For over an hour we sat on the porch of the little house in which he lived, and talked about ancient Greece, as well as my inadequate Greek would allow. He also told us about the life on top of this almost inaccessible rock; and though he was supposed to have turned his thoughts forever away from this sinful world, it was astonishing to see his curiosity about it. He set before us some resined wine, excellent fruit preserves and tobacco for rolling cigarettes. He later took us for a walk around the summit of the rock.

The area, perhaps a half acre in extent, was mostly covered by the various buildings—church, chapel, refectory, kitchen, guest room, windlass tower, store-houses and quarters for the inmates. There were two little open courts and even a tiny garden. The buildings were irregularly grouped around the larger court and skirted the edge of the rock. Great irregularity, doubtless due to the cramped space available, characterized the arrangement and architecture of the buildings. But

it is generally picturesqueness rather than harmony that constitutes the charm of domestic buildings of the Byzantine style. Wood seemed as much in evidence as stone, which proves that the present buildings were not very old; but we knew they represented the older ones which had fallen into decay, because the conservatism of the Greek church requires all restorations to carefully follow the ancient lines. In some places, where the buildings did not close the edge of the rock, a low parapet was erected to keep the monks from falling off. But some of the Meteora convents have no such protection.

St. Barlaam's is the third oldest monastery of the group, having been built in 1536. During my visit it contained only a half dozen monks, though Curzon counted fourteen in his day. But it is not only here, but all over the Greek world that monasticism is on the wane. This is especially true of the mainland of Greece, for most of the important convents are now in the former Turkish dominions or on the Ionian Islands. Owing to the eastern dislike of figures, it was impossible until recently to get reliable statistics. In Turkey (including the former European provinces) there are now about 100 convents, whereas there are only about 80 in Greece proper. But it is entirely outside Greek lands that Greek monasticism has flourished most. In Russia, since the founding of the first one at Kiev about 1050, the number of monasteries has grown, until there are now some 400 for men and 100 for women. And there are many more in other Slavic lands. During the Greek revolution many convents were destroyed by the Turks and the inmates of over 400 were dispersed. Many of these became beggars and so brought the whole institution into disrepute. At the close of the war all those containing less than six monks were suppressed by the Greek government. Since the end of Turkish oppression, men have not felt the same incentive or need to renounce the world, so most of the existing monasteries are poor, and the monks are required to do manual labor; still a few, like some of those of Mt. Athos, are still in affluent circumstances. Thus in the twenty convents on the Sacred

Mount there are some 3,000 monks and as many more lay brothers; the wealthiest monastery there, known as "Rossikon" or Russian, has 1,500 inmates; but most of the Greek ones at Athos lost their wealth in 1864 through the secularization of their estates in Rumania. Our guide told us that these convents at Meteora were all very poor and depended somewhat on the charity of chance visitors. He bewailed the indifference of the outside world; he said the former "traveling brothers" sent all over Greece to solicit funds, used to collect considerable sums, but that now this source of revenue had almost entirely ceased.

The most interesting building at St. Barlaam's is the little church. Though it is not so magnificent as the one on the opposite rock of Meteoron, still it is a very fine example of the Byzantine style. It seems to have been built in 1548 and was restored in 1780. Like most Byzantine churches—using the term broadly to distinguish Greek from Roman churches since the age of Justinian—it looked unattractive from the outside. It stood on the very edge of the cliff, one wall being flush with its vertical face. As the ground plan of all Byzantine churches is in generally very similar, I will briefly describe this tiny church in order to give you an idea of this historic style.

We first entered the vestibule or narthex—its roof was supported by old discolored marble columns and its walls were decorated with paintings in the stiff traditional style. The subjects were scenes from the Apocalypse, depicting the terrors of the last judgment; they were extremely realistic conceptions of the future state of the damned, who were represented surrounded by flames and devils with great mouths and teeth. Such scenes are never found inside the church; for they typify the future of those outside its influence. In early days penitents could only approach the vestibule, where these pictures were intended to exert a salutary influence on them. Through tradition such pictures have been perpetuated in the monastic churches. The original purpose of the narthex is presented in the Greek word which denotes a hollow stalk—the Latin ferula

—used for flogging in the early centuries of the church. Xenophon states that in his day schoolmasters used such "ferules." As we view these old pictures today they only excite our sense of humor because of their grotesqueness. But they did not always seem so ridiculous. There is record of one such narthex painting causing a whole people to become Christianized. Bogoris, a Bulgarian king, of the ninth century, hired a monk from Constantinople to paint a wall of his palace. He commissioned him to paint the most terrible picture in his power. The monk, by the advice of the king's sister, who was already a Christian, painted such a representation of hell that Bogoris himself forthwith became converted and in consequence his whole people also.

We next entered the church proper. Here was the usual vaulted Greek cross, a central dome being supported by four columns bounding the square formed by the intersecting arms. In many Byzantine churches, four lesser cupolas take the place of the vaults over the arms of the cross, thus giving the characteristic dome effect to the exterior. Everywhere the walls were covered with frescoes of holy personages. Though carved images are excluded, pictures—painted or in mosaic—are characteristic of the Eastern Church and its religion. Every Greek cottage has its eikon of the Virgin or some saint, before which a tiny lamp is kept constantly burning. These church frescoes are always in the same conventional style in black and gold, executed after the traditional models prescribed by ancient authority. This style shows complete indifference to nature, the figures being elongated, stiff in attitude and lifeless in expression. First used for centuries in mosaic, it undoubtedly derived much of its rigid character from the nature of the materials employed. This fact explains in part the disappointing contrast between such paintings and the delicacy of early Italian art. In the Byzantine style the colors and conventionalized figures, used with little variation century after century, make it often difficult to date any given painting. In restoring them the local bungling artist must

follow mechanically a sort of hieratic tradition embodied in a work on iconography. This work was composed by a monk of Athos named Dionysius. He is said to have been the pupil of Panselinus, who lived in the time of the Palaeologi. So even the poorest of these frescoes preserve the pose and dignity of the originals. When the rules of art are so stereotyped, we cannot expect a high degree of merit. The drawings and perspective are generally bad; certain scenes are even grotesque; saints are always hideous, though biblical personages are often depicted with dignity, and it may be said that the colors are never gaudy as is so often the case in the decorations of Roman churches. Greek churches cannot vie with Roman ones in size and grandeur, for they are generally small, dark and overdecorated. But their very gloominess lends dignity to their paintings.

In the dome was the usual Christ head, and in the little spandrels above the four supporting columns were the winged figures of the evangelists in mosaic. Lamps hung from the drum of the dome. Often—as in certain churches in Athos—ostrich eggs are thus suspended as emblems of faith, perpetuating the pretty legend that the ostrich hatches her eggs by looking intently at them.

At the eastern end of the nave and raised a little above it was the "bema" or sanctuary, separated from it by a wooden screen known as the "eikonostasis" from the "eikons" or holy pictures painted upon it. As St. Barlaam's church is dedicated to All Saints, there were paintings of various saints as well as those of Christ and the Virgin. Beyond the screen and bema was the usual triapsidal recess.

I might add that everything in this as in other Greek churches is intended to be symbolic: the narthex with its warning pictures, the central dome representing heaven, the four supporting columns representing the four evangelists whose gospels show the way to heaven, the bema and the curtain over the central door of the eikonostasis representing respectively the Holy of Holies and veil of the Jewish Temple.

After visiting a smaller chapel, which was probably a few years older than the church and coeval with the foundation of the monastery, we peeped into the library. It is now shorn of most of the treasures mentioned by Curzon, such as the gospels with miniatures and illuminations of the eleventh century, Aldine classics, etc. Curzon humorously describes how he tried to bargain for some of these "sacred relics," but the sight of his gold only set the monks to quarreling. A Greek, Dr. Nikos Vees, is now publishing for the Byzantine Society of Athens, in collaboration with the Greek and Bavarian governments, a catalogue of all the manuscripts in the Meteora libraries. In the years 1908–11 he discovered nearly 1,200 hitherto unknown. He has catalogued 265 in the library of St. Barlaam's alone, which date mostly from the eleventh century on. Most of these are unimportant works on theology, liturgy and lives of the saints. The oldest manuscript which he found was an uncial codex containing the homilies of St. John Chrysostom on Matthew, written in 821–2, by a monk named Eustathius. In the library of Meteoron, opposite, he found a fifteenth century manuscript of Aristotle's Poetics. But most of the important things have disappeared, spirited away by travelers or carried away to the University Library at Athens.

We next visited the refectory and kitchen. The latter was a little round stone room where a monk and a young boy were preparing the dinner. The refectory was a long low building with an apse-like end in which stood a marble table for the shew-bread. Other smaller tables were arranged in true Homeric style along the sides of the room. Frescoes representing lean and hungry looking saints adorned the walls, their expression quite out of harmony with the purpose of the room.

The guest room was a bright chamber with a row of windows overlooking the edge of the cliff. It contained a half dozen or more snow-white cots. Visitors—except ladies—are welcome to stay here as long as they wish and the monks are prepared to look well after their comfort.

The most interesting feature of our visit was the opportunity afforded us of gaining a first-hand impression of the monastic life. Assuming that most of you have never been in a Greek convent, I will briefly tell you something of how these poor monks live and how eastern monasticism differs from Roman. There is only one order—that of St. Basil. Though Eustathius of Sebaste has the honor of having introduced monasticism within the confines of Greek Christianity in Asia Minor about 340 A. D., it was St. Basil of Athens who really adapted it to Greek and European ideas and needs and who founded the first monastery at Neo-Cæsarea in Pontus some twenty years later. He had visited certain monasteries in Egypt and Syria and found they were too eremitical and austere in regard to bodily penances. He therefore set himself against these tendencies and inculcated the value of labor as well as prayer, and that community life was superior to that of hermits. He taught that fasting and corporal austerities should not interfere with usefulness and that therefore labor should be the monk's ideal, both as an occupation and for the good of others. Through successive acts of legislation eremitism was gradually subdued, though it has always maintained itself in the Greek church. Since Basil's day, the ideal work has largely yielded to that of contemplation, which is more in harmony with the Oriental temperament. But still Basil's system, though slightly modified by the subsequent reforms of Theodore, of the Great Studite monastery in Constantinople, in the ninth century, rules all Greco-Slavic convents. Thus we do not see in Greek monachism the various modifications of the monastic ideal so characteristic of the Roman orders.

Basil instituted two classes of monasteries, the cœnobitic and idiorrhythmic. In the former the monks live in common, eat at a common table and give up at entrance all their personal property for the common good. The government is monarchical, the hegoumenos being elected for life. Most Greek convents, as all these at Meteora, are managed on this principle. Each brother does for the good of all what he can best do—either

cooks, carpenters, make shoes or arrac. In the idiorrhythmic class, however, the monks retain their private means and lead a far less stringent life. The convent is ruled by a sort of republican government where each monk is independent, only the management of the common finances being delegated to two supervisors elected annually. The brothers eat alone in their cells and may supplement the common rations from their private purses. A wealthy monk may even have a servant. At Athos, where there are establishments of this sort, he can buy off at entrance all immunity from work. This system has not been very successful, as it furnishes great opportunity for jealousy and quarrelsomeness, characteristics which are as surely found among the modern Greeks as among their ancestors. In both classes of monasteries there are many lay brothers or κοσμικοί, who have taken no vows, but are hired to do the heavy work, such as hewing and carrying of wood, cultivating fields or tending herds of goats and sheep. The men who turned the windlass at St. Barlaam's I found were mostly lay brothers. In some monasteries, as at Megaspelion, old women are employed as servants. But at Athos, since the constitution of Constantine Monomachos went into effect in 1045, it has been said that neither woman nor any lesser imitation of her in the animal kingdom—neither cow, chicken nor cat—has ever set foot. The "ewig weibliche" is rigidly excluded, except in the case of the birds of the air or the mice and insects which infest the convents. This is the boast of the holy mountain, though the evidence of travelers shows that the rule has been infringed on several occasions.

There are degrees of sanctity in the Eastern as in the Western convents. At entrance most of the monks assume the "Lesser Habit," while a few then or later assume the "Greater," which outwardly is merely a woolen breastplate with a cross worked into it, worn over the ordinary black mantle.

Though monotonous and exacting, the life of the monks is very simple. If holiness means helpfulness, the holy man should be a helpful one. But this is certainly not true of Greek

monasticism. The monk of the Eastern Church no longer spends his time in learning nor in charity like his Western brother. Here, as there, it is not true that

> Pity and need make all flesh kin.

For the monk's time is spent in his own selfish interest, in the constant performance of the liturgical services of the church, in useless observances of feasts, fasts and vigils, and in endlessly repeating prayers. At Athos eight or nine hours daily are spent in prayer; on Sundays and feast days as many as sixteen and twenty hours. The monks have utterly disregarded the words of Jesus about vain repetitions, for "they think they shall be heard for their much speaking." As the first service of the day comes at one in the morning, they never get an unbroken night's rest. They cannot sit during these weary hours, but at most may rest their arms on stalls. Here at Meteora there are only three regular hours of prayer, and seven in Lent. All the time I was in the church at St. Barlaam's, I heard two brothers in front of the screen repeating over and over again the words "Kyrie eleison" and "Christe eleison."

The anchorites' food is plain in the extreme. It generally consists only of bread, olives and one or two vegetables. At Meteora the monks may eat a little meat and eggs except on Wednesdays, Fridays and fast days. In place of wine they generally drink arrac or raki, which is a colorless aromatic brandy flavored with mastic; it is very alcoholic, but the monks never drink to excess. All fasts are very carefully kept; at certain times, as during the first three days of Lent, a complete fast is observed.

The rules which govern labor are the same as in the Greek church. At least a third of the year is given over to rest, when only the most necessary work may be performed. Thus fifteen days in Lent, two weeks in August and forty days before Christmas, every Sunday and many other days are devoted to idleness. The hours not given over daily to religious purposes are devoted to reading or work and not to mental improve-

ment, for the pursuit of knowledge has never been the purpose of Eastern monasticism.

Retirement from the temptations of the world, leisure for meditation and prayer—in one word peace or tranquillity of mind and body—what is comprised in the Greek word ἡσυχία—has always been the attraction of Eastern convents. The impoverished libraries are rarely opened now. Tozer found many books at Athos thumb-marked, showing there had been a time when there was interest in reading, and everywhere still there are traditions of the golden age of Theodore, when manuscripts were zealously copied, especially in the great monastery of the Studium at Constantinople, which, in the ninth century, contained over a thousand monks. Many of the existing manuscripts of ecclesiastical and classical works are due to this age of copying. For a short time the intellectual life of the Greek Empire was in the monasteries; then illuminating, carving and painting were seriously practiced. But even then they were not seats of learning in the sense that the convents of certain western orders, like those of the Benedictines were; and now one can hardly find a trace of intellectual interests in them. The most that can be said of them is that through their sense of conservatism the monks religiously preserve their books and manuscripts as treasures—πάλαια πράγματα— without in the least knowing their value. Curzon tells how a traveler to a Bulgarian monastery found the inmates using rare old illuminated books, much the worse for wear, as knee-stools on the damp floor of their church, and how easily they were persuaded to exchange them for real stools, since the nailheads on the covers hurt their knees! But the loss of priceless manuscripts cannot always be laid at the door of the ignorance of the monks. During the Greek Revolution, for instance, Turkish soldiers quartered at Athos used manuscripts by the thousands for the manufacture of cartridges! But even here the monks helped the cause of vandalism, by using others as bait for fishing.

But we are still on the top of the rock of St. Barlaam's and it it is time for us to think of descending and continuing our visit

to the others. So we finally return to the chambers of horrors—the windlass tower. If it had looked dangerous from below to be hoisted up, on looking over the edge of the tower it looked doubly so to be let down. Besides we were before in blissful ignorance of the machinery by which the gruesome undertaking was accomplished. Now we had examined the windlass and had seen its human propellers, and they had failed to impress us with a feeling of security. I first had a wild idea of trying the ladders; but one look down their vertical sections was enough, and I became morally certain that if I ever reached the ground again, it would be even as I had come up, through the air. Else I would be doomed to spend the rest of my days up here like the aged abbot who had told me he had never been down since he first made the ascent forty years before. So at last we had to resign ourselves to our fate. The net was spread out on the floor, the blanket adjusted and my companion took his seat; the net closed over him and the executioners stood ready. At a given signal he was gently pushed to the edge, and with one final shove was dangling once more in midair. When it came my turn, that final push out into space seemed the most terrible sensation I could imagine. I was actually shoved off the top of a perpendicular cliff over 240 feet high, and with enough impetus to keep me whirling violently until the rope was finally steadied by the hand of one of the brothers. At first I dared not look down, but soon the net grew steady and I began to descend in an orderly manner. But every now and then the heavy rope would slip around the windlass and then run taut again, and for the fraction of a second I would literally drop through space till it righted—a sensation well in keeping with the whole adventure. After this ordeal had lasted three minutes, I was at last down safe and sound.

We waved a last farewell to the old hegumen above, and rode on for an hour and a half through a maze of rocks till we reached the convent of St. Stephen's—Aghios Stephanos—which crowns the summit of a magnificent precipice over-